

**USASAM
DUSTOFF
STANDING ORDERS
and
TREATMENT PROTOCOLS
TEMPLATE**

Oct 17, 2011

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FLIGHT MEDICS OATH

My duties as an aviation medical aidman are: first to be totally dedicated to the preservation of life and limb of my fellow soldier;

Second to maintain myself in a state of perpetual readiness:

Thirdly to show by example devotion to duty, honor, and country.

I will not lose faith in my God, my country, my duty, or my colleagues.

I will strive to provide the best care possible to those entrusted to my skills

This I solemnly swear on my honor and by the heavens in which men fly.

(The Flight Medics Oath, SSG George J. Parks)

USASAM DUSTOFF PROTOCOLS

ACKNOWLEDGEMENTS

The following protocols and annexes were originally developed by CPT Jeremy S. Helphenstein, DO, the Battalion Flight Surgeon for 96th General Support Aviation Battalion, 101st Combat Aviation Brigade (CAB); who was deployed to Afghanistan from December 2007 to December 2008.

CPT Helphenstein passed these protocols to MAJ Laura Kaster, M.D. the Brigade Surgeon for the 159 CAB during the RIP-TOA process in DEC 2008. She reviewed and edited the original protocols for use by C Company, 1-168th and C Company 5-159th for the OEF IX rotation.

Further acknowledgements include CPT Elisa O'Hern, (Battalion Flight Surgeon for the 563rd Aviation Support Battalion) and MAJ Chris Trollman (Battalion Flight Surgeon 7-101 General Support Aviation Battalion).

The protocols were subsequently passed to the 3rd CAB (2-3 GSAB) for use by C Company (MEDEVAC) Flight Medics during the OEF X Rotation. They were reviewed and revised for the current operational environment. Medical and administrative changes were made to better accommodate the current mission, personnel involving full-spectrum operations.

We also acknowledge CPT Chris Crowell, MD (previous 2-3 GSAB Battalion Surgeon) and CPT Karl Kusbit, AN (Critical Care Nurse with 82nd Airborne Division) who provided professional medical expertise during the protocol revision process.

I would personally like to thank MAJ Jeff Morgan and LTC Richard Roller from 3rd CAB. They revised the latest version of the protocols which were so thorough and complete, USASAM decided to adopt them as a template for all DUSTOFF units.

COL Brian W. Smalley, MC, MFS

USASAM DUSTOFF PROTOCOLS

OPERATIONAL INTENTION STATEMENT

The following aeromedical evacuation patient protocols are intended as a medical guideline for flight medics within a Combat Aviation Brigade. It is not a comprehensive in-depth manual.

It is our intention that the medical protocols are for an austere or combative environment. Medics will practice “within their scope”. Flight medics will receive medical guidance for enroute care from receiving FST’s or higher echelons of medical control.

When an attending provider is not readily available or during aeromedical evacuation; if a patient’s medical status deteriorates or deviates from the “normal protocol guidelines”; the flight medic will rely on standing orders and protocols, utilize common medical sense, maintain within their scope of medical practice, to mitigate any adverse outcome to the patient.

At a minimum, these medical protocols will be reviewed semi-annually with the battalion flight surgeon and/or aeromedical physician assistant. However, if a medical necessity is warranted, e.g. (medication or dose change, new procedure, new equipment, etc.), updates will be more frequent. The established protocols and recommended changes will be forwarded to the brigade for review and disposition by the Commander and Medical Director.

Quality Assurance and Control Procedures

Purpose: Provide direction for the implementation of Quality Assurance and Control measures for Flight Medics outside garrison environment to include: combat/austere, natural disaster (CONUS/OCONUS) and in response to Chemical Consequence Management Reaction Force (CCMRF) missions.

Medical oversight of Flight Medic training for procedures, protocols, medications, documentation (Patient Care Reports), testing, credentials, etc., is primarily the responsibility of the Battalion Flight Surgeon (FS) with the assistance of the Aero-medical Physician Assistant (APA-C) and designated company Medical Training NCO. The Brigade Surgeon through delegation from the Brigade Commander has responsibility for overall medical oversight. Development of these policies and procedures should include the expertise of an emergency medicine or trauma physician. Additionally, all medical providers (i.e., PA/RN/MD/DO) and medics should keep current on recent literature and equipment pertaining to pre-hospital aero-medical evacuation care.

Quality Assurance

Written Protocols

Protocols are written patient care guidance in algorithmic format with emphasis based on ACLS, PALS, and the patient's medical condition. Both medics and providers are to use these protocols in the care of patients they transport to the next higher level of care. Periodically, they are tested on information and procedures contained within these protocols. After each patient that has been aero medically evacuated to a Role/Level II or Role/Level III medical treatment facility, each medic or provider is responsible for documenting the care rendered during transport via the electronic or written patient care report (PCR).

Direct Supervision

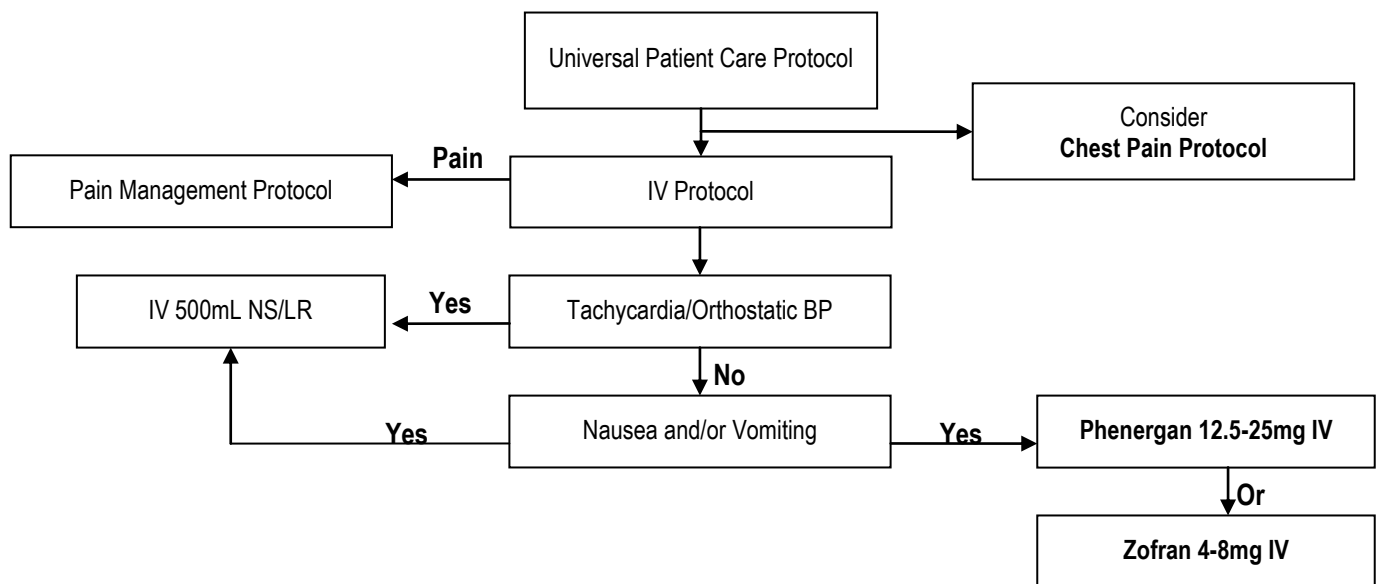
In addition to the written protocols, medical providers are responsible for the direct supervision of the flight medic; his/her performance in situations in which the patient's medical condition(s) does not meet specific criteria for written protocols. For aero-medical evacuations that are "critical care", a medical provider will accompany the medic and assist in the patient's medical care.

Quality Control

After each MEDEVAC evacuation, the team conducts an informal After Action Review (AAR). The initial formal control measure is the requirement for the FS or APA-C to review and co-sign the PCR before it is submitted as a part of the patient record. After both the flight medic and medical provider have signed the PCR, a copy will be kept in accordance with current Army policy guidelines, local unit policy, medical training NCO and/or FS.

ABDOMINAL PAIN

History: <ul style="list-style-type: none"> • Age • Past medical/surgical history • Onset • Palliation/Provocation • Quality (crampy, constant, sharp, dull, etc.) • Region (RUQ, RLQ, LUQ, LLQ) • Radiation/Referred Pain • Severity • Timing (constant, duration) • Fever • Last meal/bowel movement/emesis • Menstrual hx/Pregnancy Status 	Signs and Symptoms: <ul style="list-style-type: none"> • Pain (location/migration) • Tenderness • Nausea/vomiting • Diarrhea (bloody?) • Dysuria • Constipation • Vaginal bleeding/discharge • Distention • Guarding/Rigidity Associated symptoms: Fever, headache, weakness, malaise/fatigue, myalgias, cough, mental status changes, rash	Differential Diagnosis: <ul style="list-style-type: none"> • Appendicitis • Gastroenteritis (food borne/infectious) • Bowel obstruction • Diverticulitis • Trauma • Ectopic pregnancy • Pelvic Inflammatory dz. • Myocardial Infarction • Gallbladder dz. • Pancreatitis • Kidney stone • Abdominal aneurysm • Peptic Ulcer dz/Gastritis • Lung disorders (pneumonia, pulmonary embolus)
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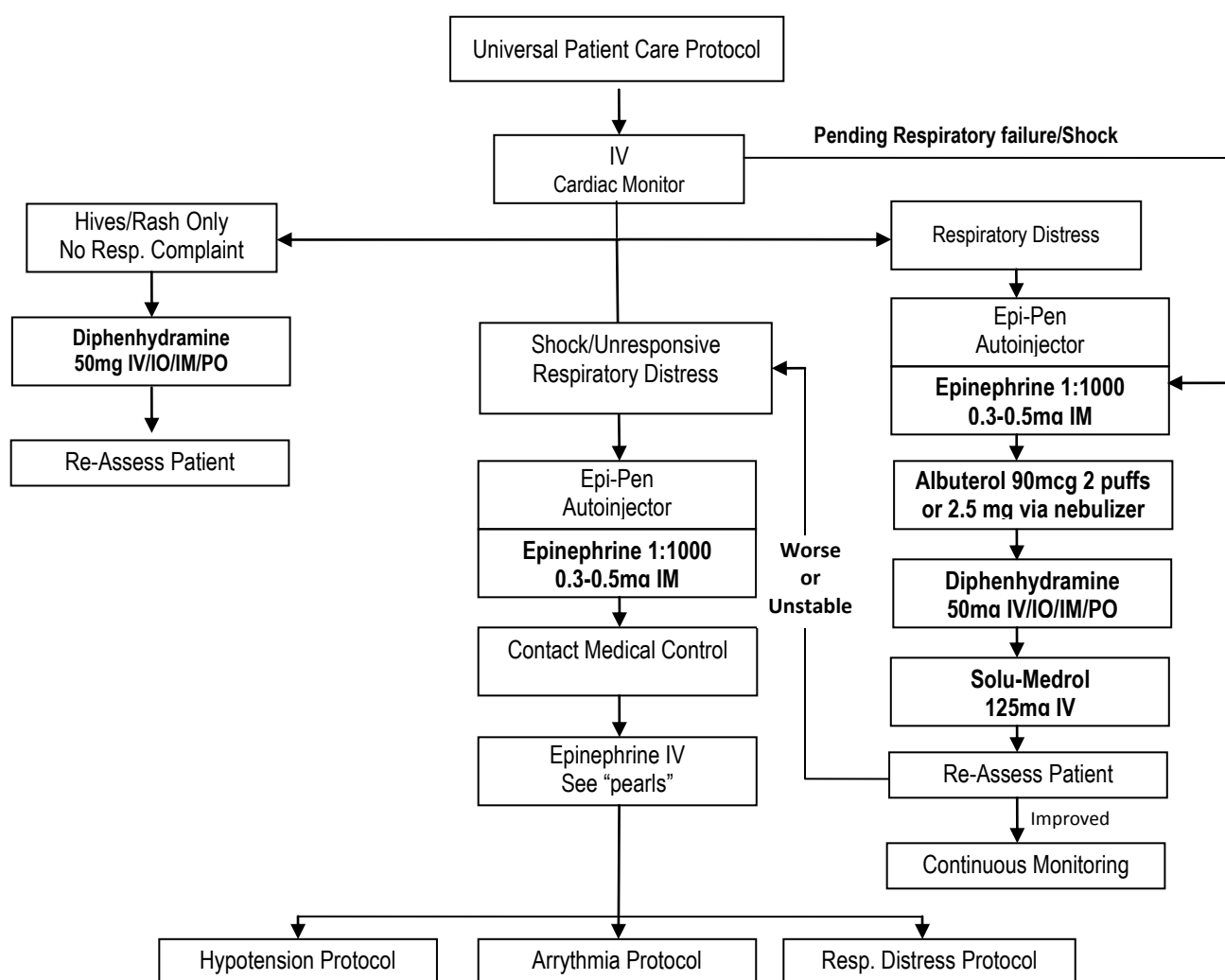


Pearls:

- Maintain a high index of suspicion for ectopic pregnancy as a cause of abdominal pain in females of childbearing age.
- Antacids should be avoided in patients with renal disease.
- Patients older than 50yo are at increased risk for life-threatening diagnoses (i.e. AAA).
- Appendicitis presents with vague, periumbilical pain that migrates to the RLQ. This classic presentation may not be present in some patients.
- Repeat VS after each intervention. In non-traumatized patients, may repeat fluid bolus PRN depending on patient condition and VS. In trauma patients, fluid boluses should be used in accordance with hypotensive resuscitation guidelines (see Multiple Trauma Protocol).
- Choose the lower phenergan dosage for patients likely to experience sedative effects (elderly, etc.).
- Phenergan contraindicated in any patient <2yo (see pediatric protocols).
- Pain management can be used PRN.

ALLERGIC REACTION

History: <ul style="list-style-type: none"> Onset and location Bite or sting History of anaphylaxis Food allergy/exposure Medication allergy/exposure New clothing/soap/detergent Past medical history Medications 	Signs and Symptoms: <ul style="list-style-type: none"> Itching or hives Cough/wheeze/resp. distress Chest/Throat tightness Difficulty swallowing Hypotension or shock Edema Nausea/Vomiting 	Differential Diagnosis: <ul style="list-style-type: none"> Urticaria (rash only) Shock (other than anaphylactic) Angioedema Aspiration/Airway obstruction Asthma or COPD Pulmonary edema/CHF
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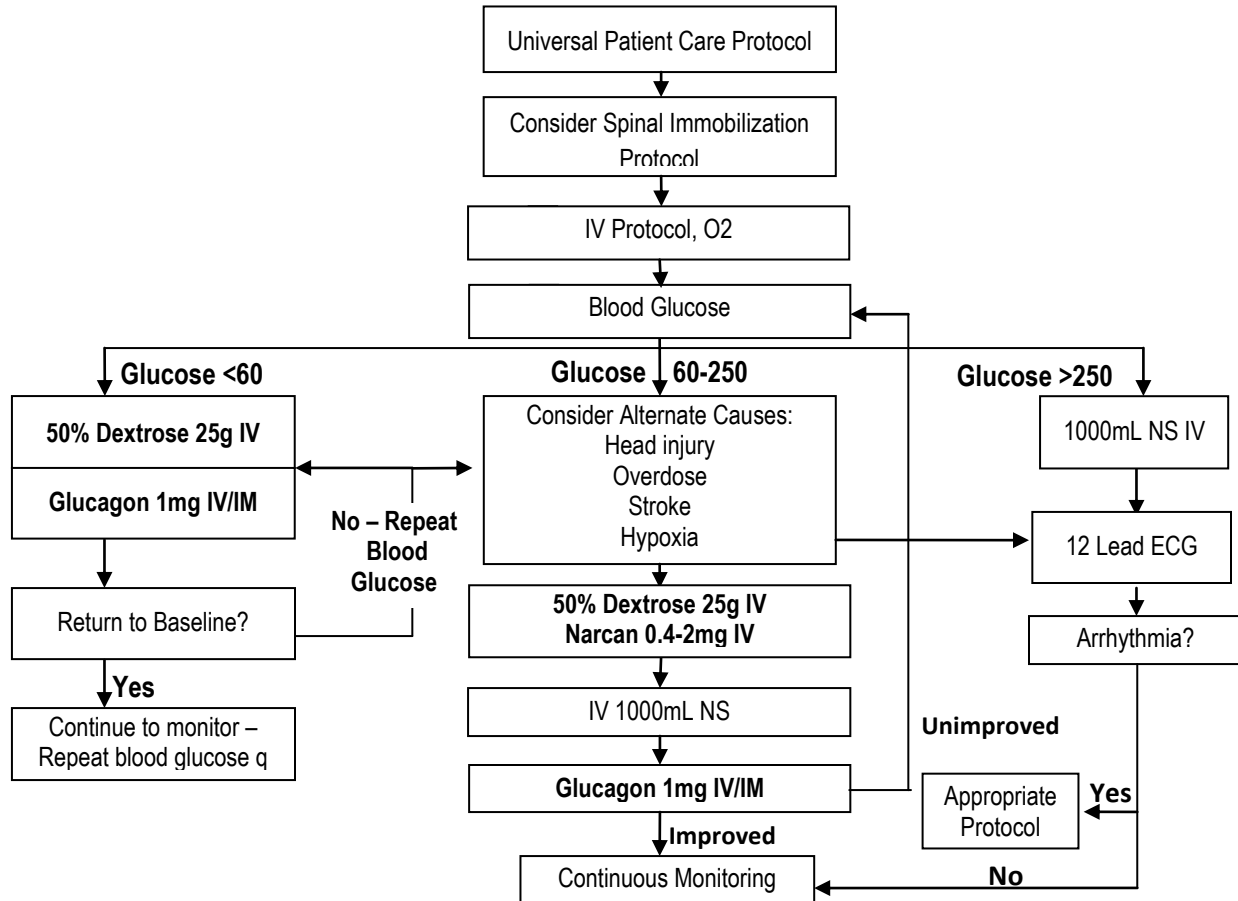


Pearls:

- Contact medical control prior to giving epinephrine IV, or to patients >50yo, pregnant, have a history of cardiac disease, or have HR > 150. Epinephrine can precipitate dysrhythmias/ischemia – all patients should be on monitors and have 12lead ECG.
- To mix epinephrine for IV:
 - 0.1mL of 1:1000 epinephrine in 10mL NS – push over 10-15min (100mcg)
 - 1mL 1:1000 epinephrine in 500mL D5W - @ 0.5-2mL/min = 1-4mcg/min.
 - 1mg 1:10,000 epinephrine (cardiac vial) in 250mL D5W (4mcg/mL) – run @ 1-4mcg/min (15-60mL/hr)
- The shorter the interval from contact to symptoms, the more severe the reaction.

ALTERED MENTAL STATUS

History:	Signs and Symptoms:	Differential Diagnosis:
<ul style="list-style-type: none"> Known diabetic, medic alert tag Any known drug use Possibility of toxic ingestion Past medical history Medications Trauma Change from previous condition Seizure activity 	<ul style="list-style-type: none"> Decreased mental status/coma Bizarre behavior Somnolence Diaphoresis/Dry, red skin Polyuria / polydipsia Fruity breath Altered respirations Signs of trauma Fever 	<ul style="list-style-type: none"> Head trauma Stroke CNS tumor/mass/bleed/infection Thyroid dysfunction Hyperglycemia/hypoglycemia Diabetic Ketoacidosis Toxic ingestion Environment (hyperthermia/hypothermia) Hypoxia Psychiatric disorders Seizure Disorder Sepsis

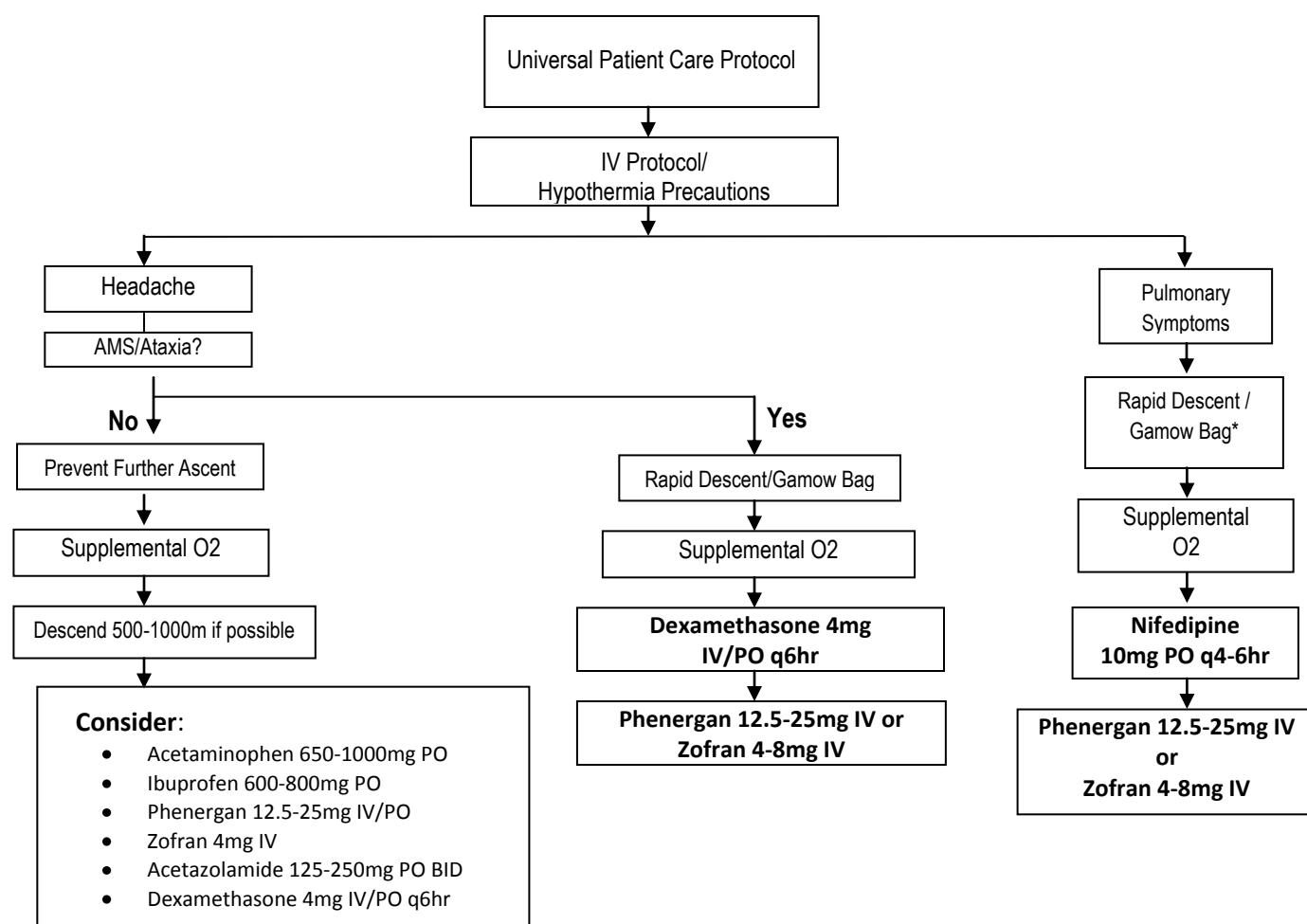


Pearls:

- Be aware of AMS as a presentation of environmental exposure/toxins/hazmat – use personal protection accordingly/decon.
- Recheck blood glucose after any intervention.
- Oral glucose okay if patient alert/protecting airway, and solution available. Proteins + complex carbs (i.e. sandwich, granola) are better, longer lasting glucose source than simple sugars.
- EKG should be obtained in all suspected toxin or diabetic ketoacidosis cases – evaluate for tall, peaked T-waves (hyperkalemia) or QRS widening >100ms (toxins).
- Restrain patient as necessary for their and crewmembers safety during flight
- Glucagon may cause nausea/vomiting – should have anti-emetic prepared.

ALTITUDE ILLNESS

History: <ul style="list-style-type: none"> Past Medical History Altitude attained Time at altitude Medications Rate of ascent 	Signs and Symptoms: <ul style="list-style-type: none"> Altered Mental Status/Confusion Headache Ataxia/abnormal gait Rapid breathing Hypoxia Hemoptysis Cough 	Differential Diagnosis: <ul style="list-style-type: none"> Head trauma Stroke CNS tumor/mass/bleed/infection Endocrine disorder Toxic ingestion Pneumonia/PE Cephalgia
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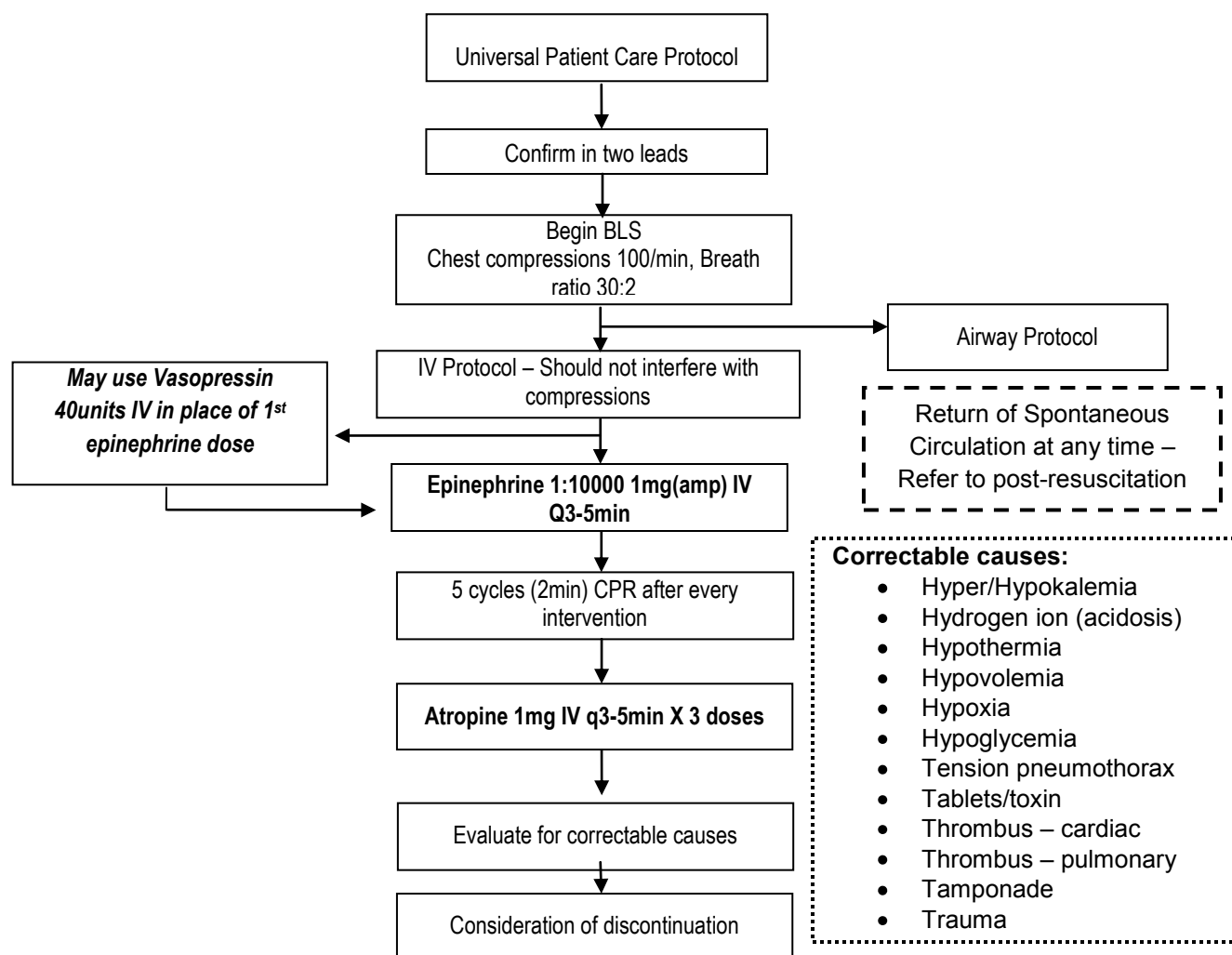


Pearls:

- The treatment of choice for all Altitude-related illnesses is supplemental O2 and descent – at least 500-1000m. If unable to descend, a hyperbaric bag (Gamow bag) can be utilized if available.
- Acetazolamide should not be given to those patients with Sulfa allergies.**
- High-altitude pulmonary edema often occurs along with High-altitude cerebral edema. These patients may have crackles/fever/hypoxia.
- *Descent should be done with the least amount of patient exertion possible to prevent worsening of the condition.
- ANY altered mental status/confusion/abnormal gait should be presumed to have Cerebral edema and descent should be undertaken immediately.

ASYSTOLE / PEA

History: <ul style="list-style-type: none"> • Past medical history • Medications • Events preceding arrest • History of renal disease • Estimated downtime • Environmental exposure • Suspected toxic ingestion 	Signs and Symptoms: <ul style="list-style-type: none"> • Pulseless • Apneic • No electrical activity in at least two ECG leads (asystole) • Electrical activity on monitor without pulses (PEA) • No heart tones 	Differential Diagnosis: <ul style="list-style-type: none"> • Medical or trauma • Hypoxia • Electrolyte imbalance (esp. potassium) • Drug overdose • Hypothermia • Device error
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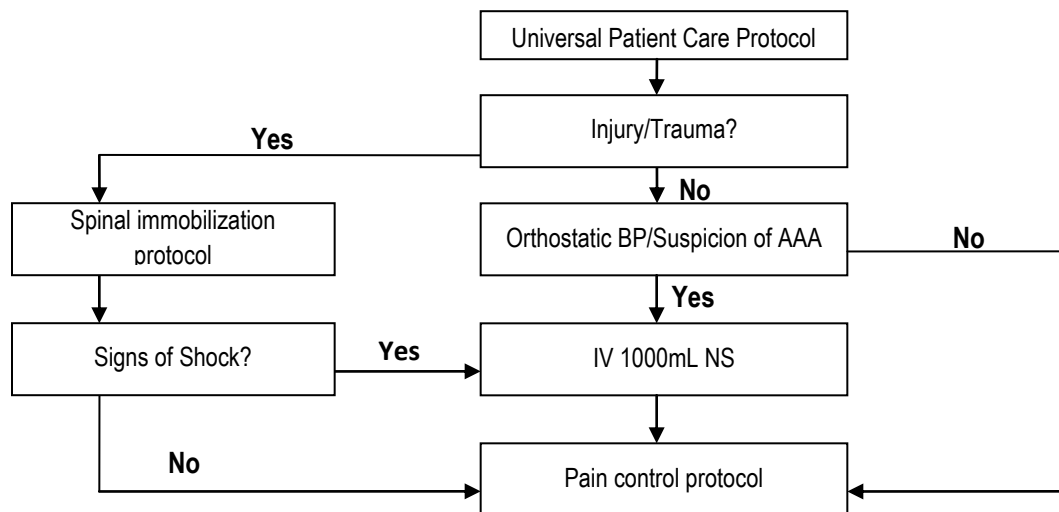


Pearls:

- Correctable causes should be addressed as soon as possible.
- Should take at least 1 minute to check for pulse in hypothermic patients.
- If no IV – can use 2X IV dosage of epinephrine through an endotracheal tube, if present. (can use 1:1000 formulation).
- Consider discontinuation of efforts if:
 - Asystole following trauma – especially blunt
 - Prolonged downtimes - > 15min
 - Prolonged code with no response - >3 rounds of medications, 30min of resuscitation

BACK PAIN

History: <ul style="list-style-type: none"> • Age • Past medical/surgical history • Medications • Onset/location of pain • Previous injury • Trauma • Fever • Hematuria 	Signs and Symptoms: <ul style="list-style-type: none"> • Pain • Swelling • Pain with motion • Weakness/numbness • Bowel/bladder dysfunction 	Differential Diagnosis: <ul style="list-style-type: none"> • Muscle spasm/strain • Degenerative disc disease • Fracture • Kidney stone/infection • Abdominal aortic aneurysm • Pneumonia/PE • Cauda equine syndrome • Tumor/mass/infection
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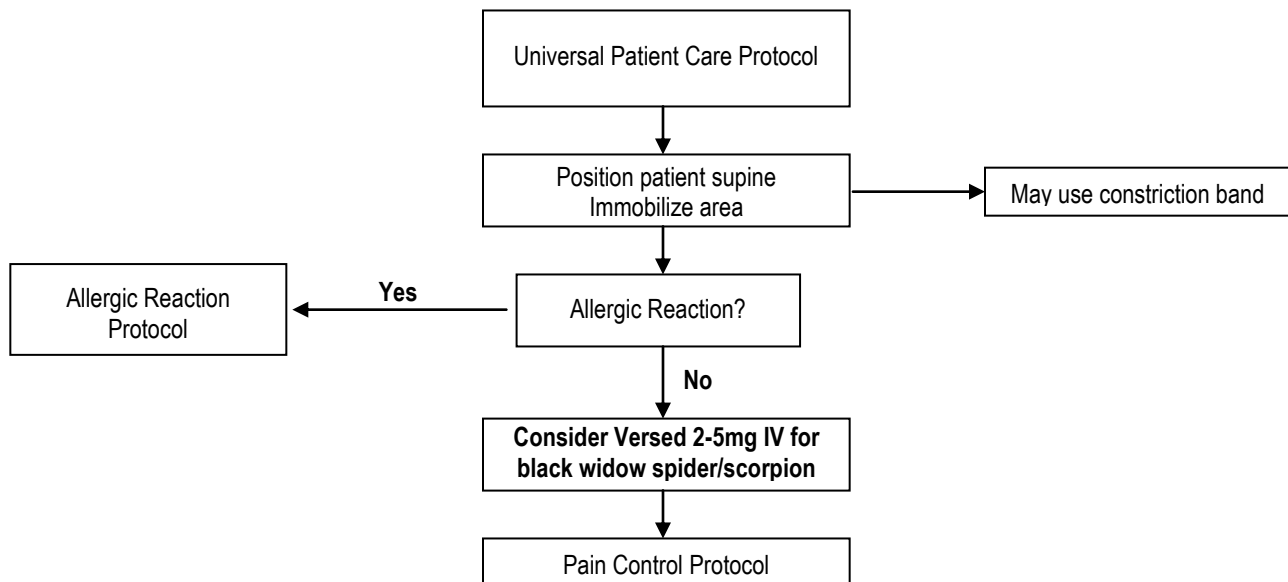


Pearls:

- Examine: Mental status, HEENT, Neck, Chest, Lungs, Abdomen, Back, Extremities, Neuro.
- Abdominal aortic aneurysm is a concern in hypertensive/diabetic/>50yo populations – feel for pulsatile abdominal mass. Symptoms may mimic kidney stones.
- Patients with trauma/midline tenderness should be immobilized.
- Any bowel/bladder incontinence is significant and may represent true surgical emergency (**Cauda Equina Syndrome**)

BITES / ENVENOMATIONS

History: <ul style="list-style-type: none"> • Type of bite/sting • Description/photo of animal/insect involved • Time/location/size of bite/sting • Previous allergic reactions • Domestic vs Wild animal • Tetanus and rabies risk 	Signs and Symptoms: <ul style="list-style-type: none"> • Rash, skin break, wound, retained stinger • Pain, swelling, erythema • Bleeding/discharge • Shortness of breath/wheezing/throat tightness • Hypotension or shock 	Differential Diagnosis: <ul style="list-style-type: none"> • Bite / envenomation • Other allergic reaction • Anaphylaxis • Rabies/tetanus risk
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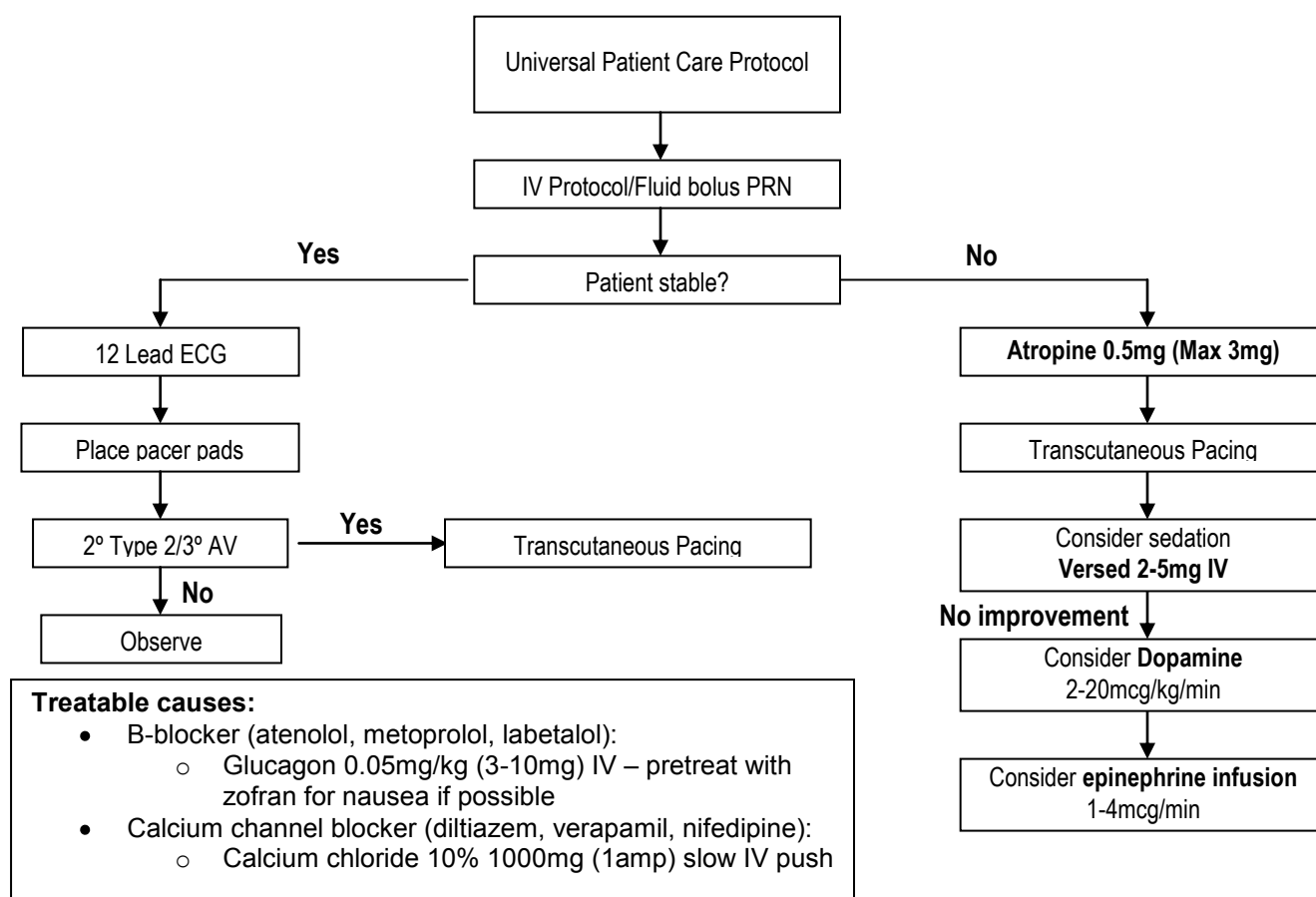


Pearls:

- Never attempt to capture/transport a live animal/insect.
- Amount of envenomation from snake bites can be variable – assume all are lethal.
- For snake envenomations – do not use ice/tourniquets as these can worsen the effects of toxins – a constriction band may be placed proximally to slow lymphatic spread.
- Black Widow spider bites tend to be minimally painful, but then develop into severe pain in muscles/abdomen with muscular spasm over hours. The abdominal pain may mimic surgical abdomen.
- Brown recluse spider bites may be painless or result in burning sensation. A blister may form over hours – which later can turn into tissue necrosis. Abnormal vital signs in association with a brown recluse bite may symbolize systemic toxicity (loxoscelism) – which requires emergent treatment.
- Outside of the U.S. – there are few reliable anti-venoms for poisonous snakes/insects.
- All animals should be considered rabid outside the U.S. until proven otherwise. This excludes rodents, which do not carry rabies.
- Anaphylactic reactions should be treated as soon as recognized.

BRADYCARDIA

History: <ul style="list-style-type: none"> Past medical history Medications Toxic ingestions Pacemaker 	Signs and Symptoms: <ul style="list-style-type: none"> HR < 60bpm Chest pain Respiratory distress Hypotension/shock Altered mentation Syncope 	Differential Diagnosis: <ul style="list-style-type: none"> Acute MI Hypoxia Hypothermia Sinus bradycardia Physiologic bradycardia (athletes) Stroke Spinal cord lesion Toxin/Medications (B-blockers) AV block/Sick sinus syndrome
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Pearls:

- Decompensation at any time (altered MS, hypotension, etc.) should prompt treatment as unstable patient.
- 2nd degree type II and 3rd degree AV block require pacing, as they can lead to decompensation.
- All bradycardic patients should have pacer pads in place after initial evaluation.
- Epinephrine infusion for refractory bradycardia:
 - 1mL 1:1000 in 500mL D5W @ 0.5-2mL/min
 - 1mL 1:10000 in 250mL D5W (4mcg/mL) @ 15-60mL/hr
- Evaluate for treatable causes of bradycardia (B-blockade, Ca Channel blockade).

BURNS

History: <ul style="list-style-type: none"> Type of burn (thermal, chemical, electrical) Inhalation injury Time of injury Other trauma / second injury Loss of consciousness Immunization history Past medical history Medications 	Signs and Symptoms: <ul style="list-style-type: none"> Burns, pain, swelling Dizziness Loss of consciousness Airway involvement (singled nasal hair, carbonaceous sputum, etc) Hoarseness/wheezing Loss of consciousness 	Differential Diagnosis: <ul style="list-style-type: none"> Superficial burns (1st degree) Partial thickness (2nd degree) Full thickness (3rd degree) Chemical burns Thermal burns Electrical burns Radiation Secondary trauma
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PARKLAND FORMULA (Fluid Resuscitation)

- 4mL X %TBSA burned X Weight (Kg) over 24hr.
- Half given over 1st 8hr **from time of burn**. remainder over next 16h

Universal Patient Care Protocol

Remove rings, bracelets, or other constricting items

Position patient supine
Immobilize area

Rapid examination for
other injuries

Airway protocol

Yes

Airway involvement?

No

Thermal/Electric

Chemical

Remove burning/charred clothing
Cool with sterile saline/gel pad

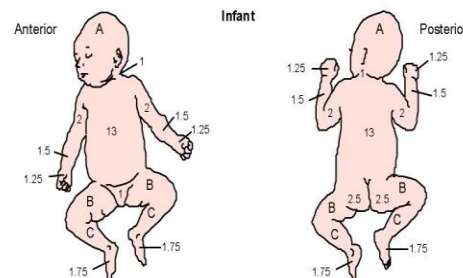
Remove contaminated clothing
Flush area with saline 10-15min

Cover with Dry sheet/dry sterile
dressings

Eye involved?
Flush with saline X 30min

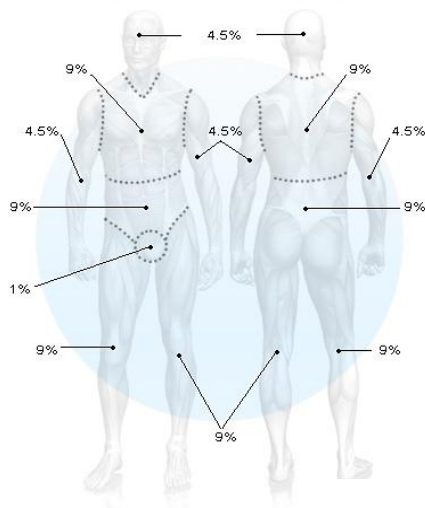
Fluid replacement – Parkland
formula

Pain control protocol



AREA	BIRTH	AGE 1 YR	AGE 5 YR
A = 1/2 of head	9 1/2	8 1/2	6 1/2
B = 1/2 of one thigh	2 3/4	3 1/4	4
C = 1/2 of one leg	2 1/2	2 1/2	2 3/4

Burn Percentage in Adults: **Rule of Nines**

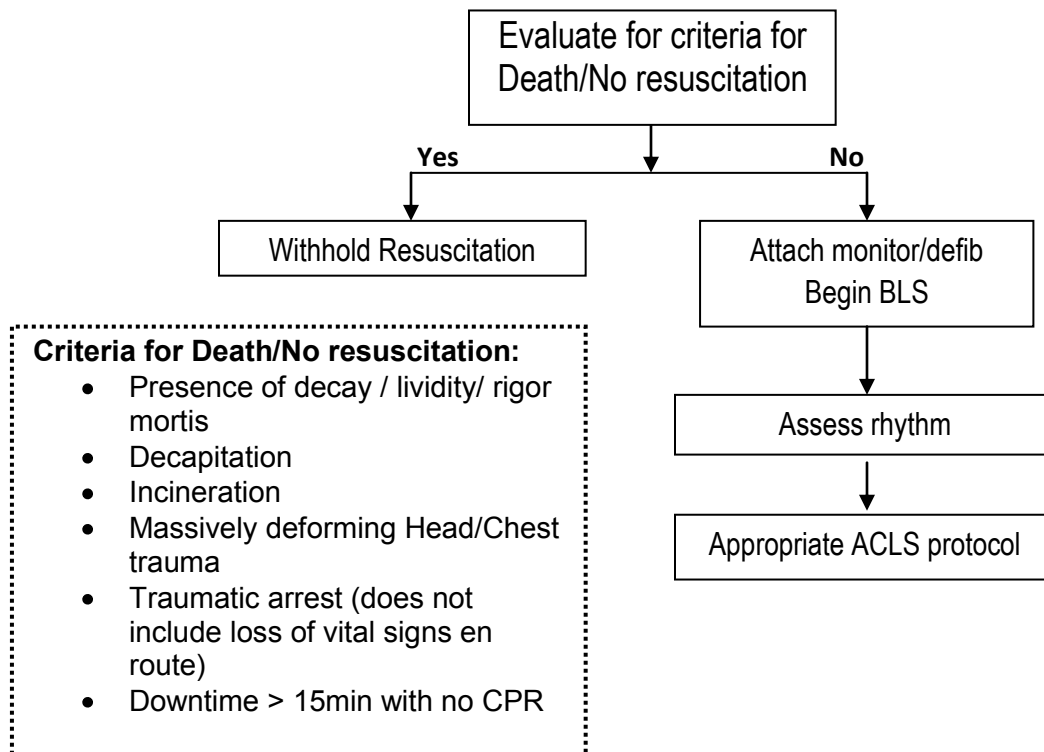


Pearls:

- Burns with airway involvement require immediate airway protection with RSI/surgical airway.
- Parkland formula may underestimate fluid requirement for electrical burns – maintain urine output 1mL/kg/hr.
- Burn patients are prone to hypothermia – must protect from environment. Also, never use ice to cool large burn areas.
- Do not overlook the possibility of multi-system trauma in burn patients.
- All burns require 100% O₂ via NRB unless intubated.
- Never use nitrites for suspected cyanide toxicity in enclosed space fires – can worsen hypoxia. Creates methemoglobinemia.

CARDIAC ARREST

History: <ul style="list-style-type: none"> • Events leading to arrest • Estimated downtime • Past medical history • Medications • Trauma 	Signs and Symptoms: <ul style="list-style-type: none"> • Unresponsive • Apneic • Pulseless 	Differential Diagnosis: <ul style="list-style-type: none"> • Medical vs. Traumatic arrest • Dysrhythmia
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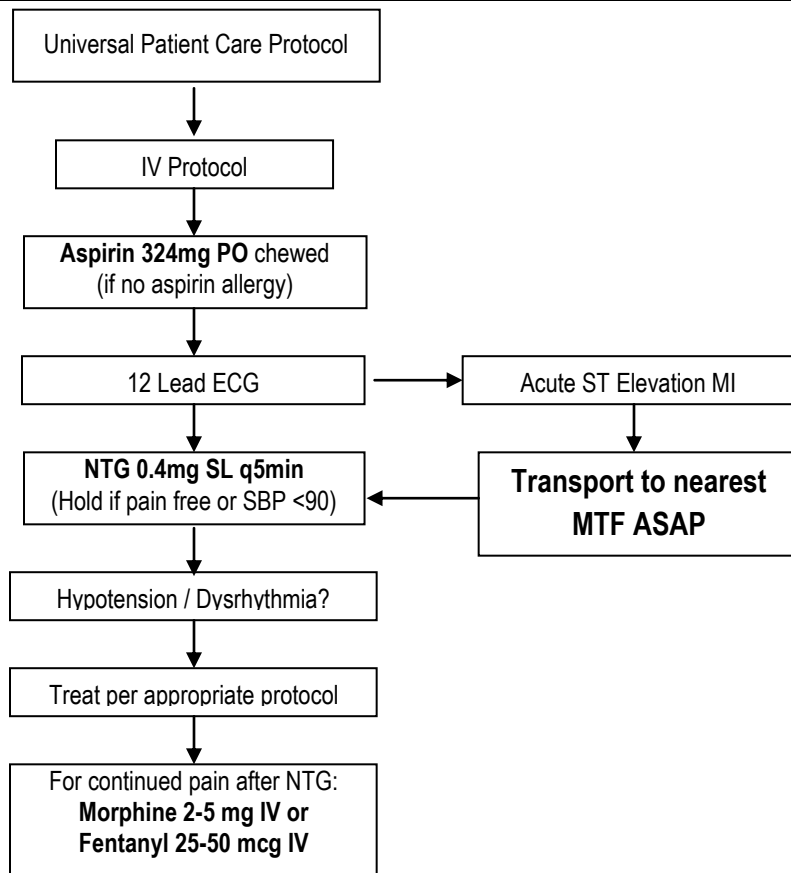


Pearls:

- As with all ACLS protocols – **concentrate on adequate compressions.**
- Minimize interruptions in compressions, including if/when placing advanced airway.
- Early defibrillation associated with greatest success in early cardiac arrest.
- Survival rate for traumatic arrest approaches zero.
- Cardiac arrest in MASCAL situations requires frequent re-triage to apply care where it will be most effective.
- Lack of response alone does not equal death – always check for pulse/cardiac activity.

CHEST PAIN

History: <ul style="list-style-type: none"> • Age • Past medicines, history, cardiac history • Medications (includes Viagra, levitra, cialis) • Allergies • Timing (duration, continuous vs. recurring) • Onset • Quality of pain 	Signs and Symptoms: <ul style="list-style-type: none"> • Chest pain • Radiation of pain • Location of pain • Pale/diaphoretic/lightheaded • Nausea/vomiting • Shortness of breath 	Differential Diagnosis: <ul style="list-style-type: none"> • Angina • Acute MI • Pericarditis • Pulmonary embolism • Asthma/COPD • Pneumothorax • Aortic dissection/aneurysm • GERD • Esophageal spasm • Chest wall injury/pain
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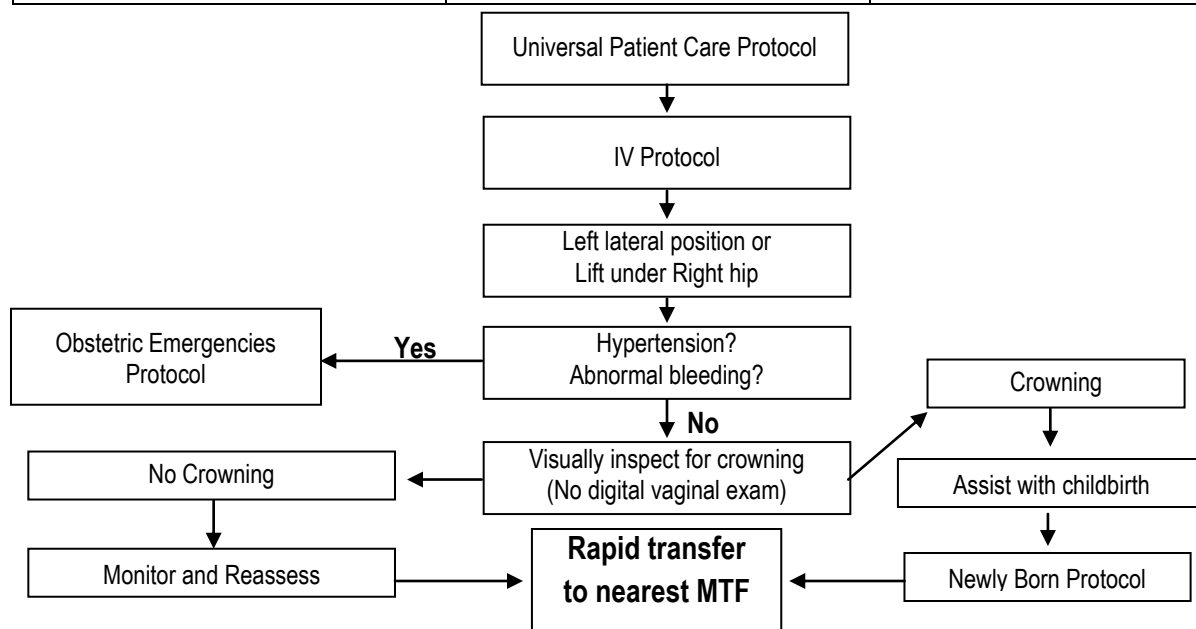


Pearls:

- Patients with suspected AMI should be transferred to the nearest MTF for further treatment / thrombolytics.
- With inferior MI (ST Elevations in leads II, III, AvF), NTG may cause hypotension so use with caution. Add small fluid boluses for low BP.
- Ensure that you have IV access before giving SL NTG.
- Dysrhythmias are common cause of death with AMI (VFIB / pulseless VTACH).
- Viagra / Cialis / Levitra are contraindications to the use of NTG.
- **Hold Morphine or Fentanyl for SBP < 90.**
- Max dose Morphine 20 mg, Fentanyl 200 mcg for non-traumatic chest pain (higher doses may be required for trauma, see Pain Control algorithm).

CHILDBIRTH

History: <ul style="list-style-type: none"> • Time contractions started/spacing • Due date • Gravida/Para status • Single/Twins/Etc. • Fetal activity • Medications • Past medical history 	Signs and Symptoms: <ul style="list-style-type: none"> • Spasmodic pain • Vaginal fluid/bleeding • Crowning/urge to push • Meconium 	Possible Complications: <ul style="list-style-type: none"> • Preterm labor • Spontaneous vaginal delivery • Placenta previa • Prolapsed cord • Abnormal presentation (i.e. breech)
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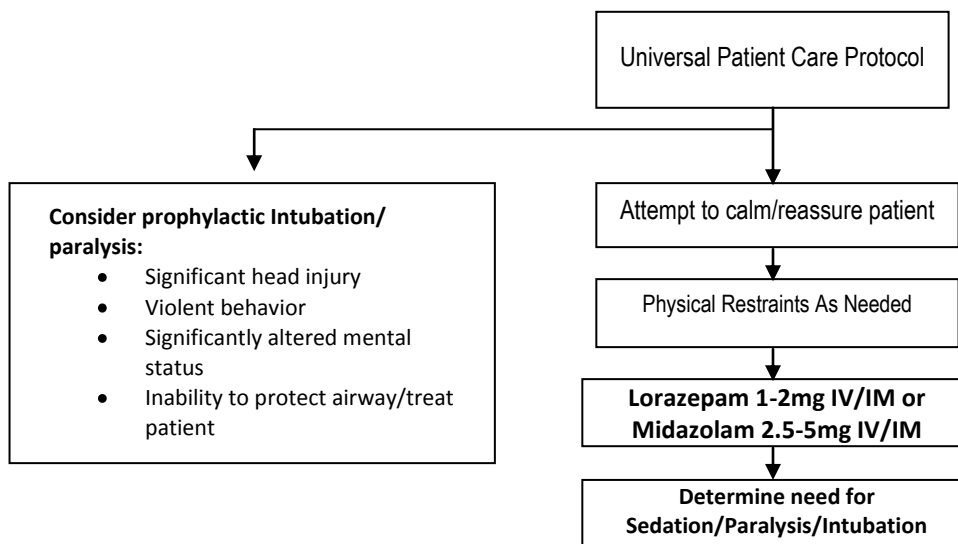


Pearls:

- Document all times – delivery, contraction frequency/length.
- Assist with birth:
 - Position mother as necessary.
 - Prepare 2 sets of hemostats and scissors/scalpel, umbilical cord clamp if available, bulb suction.
 - If umbilical cord palpable around neck– attempt to reduce manually prior to delivery of head (should feel rope-like structure around neck).
 - If prolapsed cord seen (overlying fetal head) – use upward pressure on fetal presenting part to delay delivery.
 - Suction nose and mouth immediately after delivery of head.
 - Use slight downward pressure to deliver superior shoulder, then slight upward pressure to deliver lower shoulder.
 - Hold child below level of mother, clamp cord with 2 hemostats and cut between clamps.
 - Immediately wrap infant and give to mother – assistant to aid in monitoring child.
 - Deliver placenta – should feel lengthening/giving way of cord and gush of blood – keep placenta for pathology evaluation (This process may take up to 30min. **Never** pull on the umbilical cord in attempts to speed delivery.)
 - Massage uterus to encourage contraction and limit bleeding.

COMBATIVE PATIENT

History: <ul style="list-style-type: none"> • Past Medical History • Medications/Drug use • Psychiatric History • Types of injuries • Prior violent behavior 	Signs and Symptoms: <ul style="list-style-type: none"> • Bizarre behavior • Violent activities • Head injuries/AMS • Anxiety • Tachycardia/Elevated BP 	Differential Diagnosis: <ul style="list-style-type: none"> • Head trauma • Thyroid dysfunction • Hyperglycemia/hypoglycemia • Diabetic ketoacidosis • Toxic ingestion • Environment (hyper/hypothermia) • Hypoxia • Psychiatric disorders
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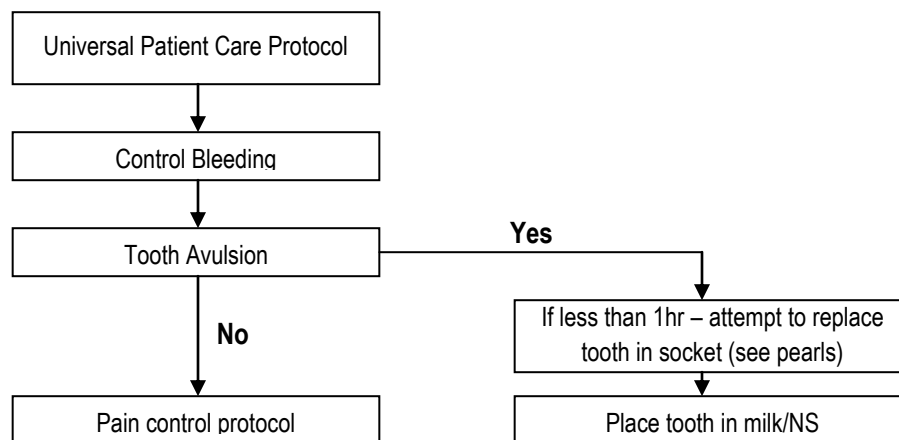


Pearls:

- Combative patients present a very real threat to the safety of themselves, the medic, and the aircrew during flight. For this reason, any patient with altered mental status and the potential for combativeness that would threaten aircrew safety or themselves should be prophylactically sedated/paralyzed and intubated for the flight.
- In conscious patients, attempts should be made to explain the procedure/reassure the patients prior to restraining.
- Physical restraints such as tying down patient hands to prevent pulling lines, etc., should be limited to the least amount necessary to accomplish treatments/prevent injuries.
- Use of sedative medications adds risk of decreasing respiratory drive and should be used with caution. However, medications should be titrated to adequate dosage to control patient. Be prepared for airway interventions/vomiting if used.

DENTAL PROBLEMS

History:	Signs and Symptoms:	Differential Diagnosis:
<ul style="list-style-type: none"> • Past medical history • Medications • Onset of pain/injury • Trauma • Location/storage of tooth 	<ul style="list-style-type: none"> • Bleeding • Pain • Fever • Swelling • Missing/fractured tooth 	<ul style="list-style-type: none"> • Dental caries • Infection • Fracture • Avulsion • Abscess • Cellulitis / Gingivitis

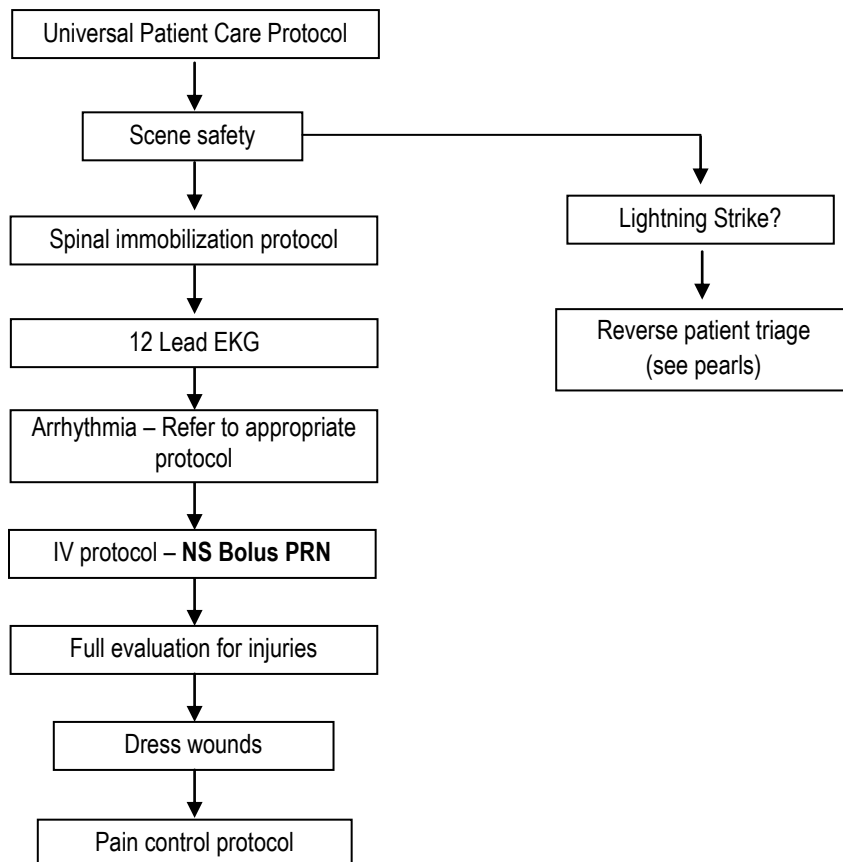


Pearls:

- Significant soft tissue swelling to face/mouth can represent cellulitis or an abscess.
- In avulsion – gently rinse (do not scrub) tooth with NS and attempt to re-implant with firm pressure into the socket. This should only be done with complete avulsions. **Never perform this in children with primary teeth.**
- Occasionally, cardiac chest pain can radiate to the jaw.

ELECTRICAL INJURY

History: <ul style="list-style-type: none"> • Lightning or electrical exposure • Single/multiple victims • Secondary trauma • Duration of exposure • Voltage/current (AC/DC) 	Signs and Symptoms: <ul style="list-style-type: none"> • Burns • Pain • Arrhythmia • Loss of consciousness • Entry/exit wounds • Shock/hypotension • Cardiac arrest 	Differential Diagnosis: <ul style="list-style-type: none"> • Cardiac arrest • Environmental exposure • Seizure • Burns • Multiple trauma
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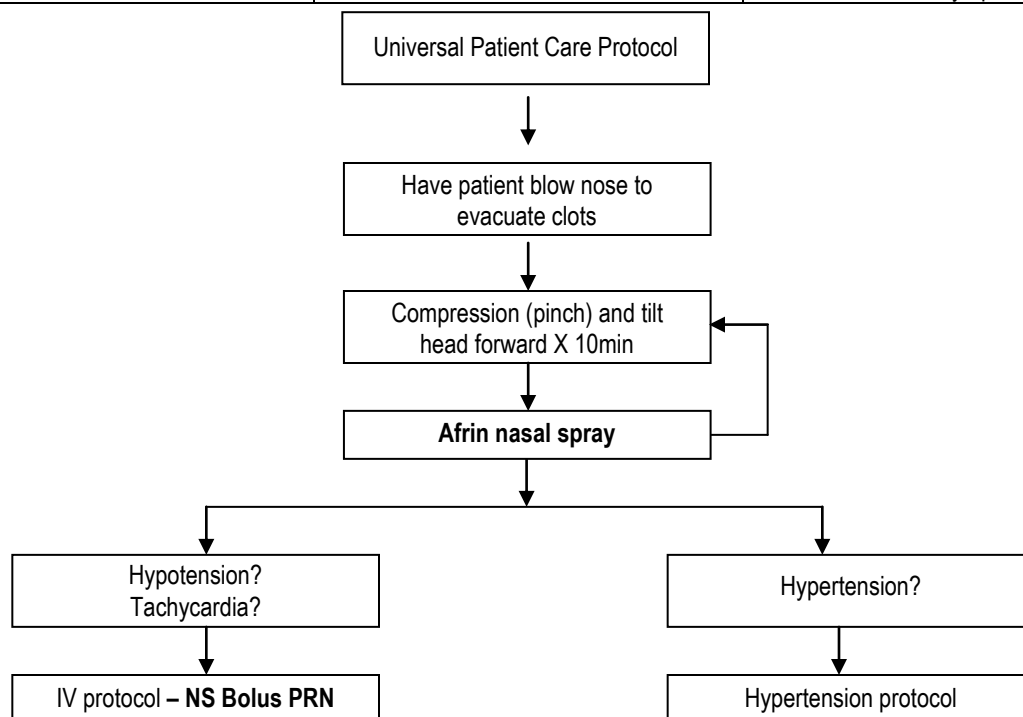


Pearls:

- **Ventricular fibrillation (AC) and Asystole (DC) are the most common Dysrhythmias seen with electrical shock.**
- Damage is often hidden as current follows conductive structures (i.e. blood vessels, nerves, muscle).
- In mass casualty situations where lightning is involved – reverse triage should be performed. Those victims in full arrest should be resuscitated first. The reason for this is the respiratory center of the brain takes longer to recover from the shock than the heart and respiratory support during this period can lead to survival.
- Do not overlook secondary trauma.
- Electrical shock victims do not “store” electricity.
- Many electrical injury patients will also have significant burn injuries – do not overlook fluid resuscitation.

EPISTAXIS

History: <ul style="list-style-type: none"> • Past medical history • Medications • Previous episodes • Trauma • Duration of bleeding • Quantity of bleeding 	Signs and Symptoms: <ul style="list-style-type: none"> • Bleeding from one or both nares • Pain • Nausea/vomiting • Nasal deformity 	Differential Diagnosis: <ul style="list-style-type: none"> • Trauma • Infection • Allergic/chemical rhinitis • Nose picking • Lesions (polyp, ulcer) • Hypertension • Anticoagulant Therapy • Thrombocytopenia (ITP)
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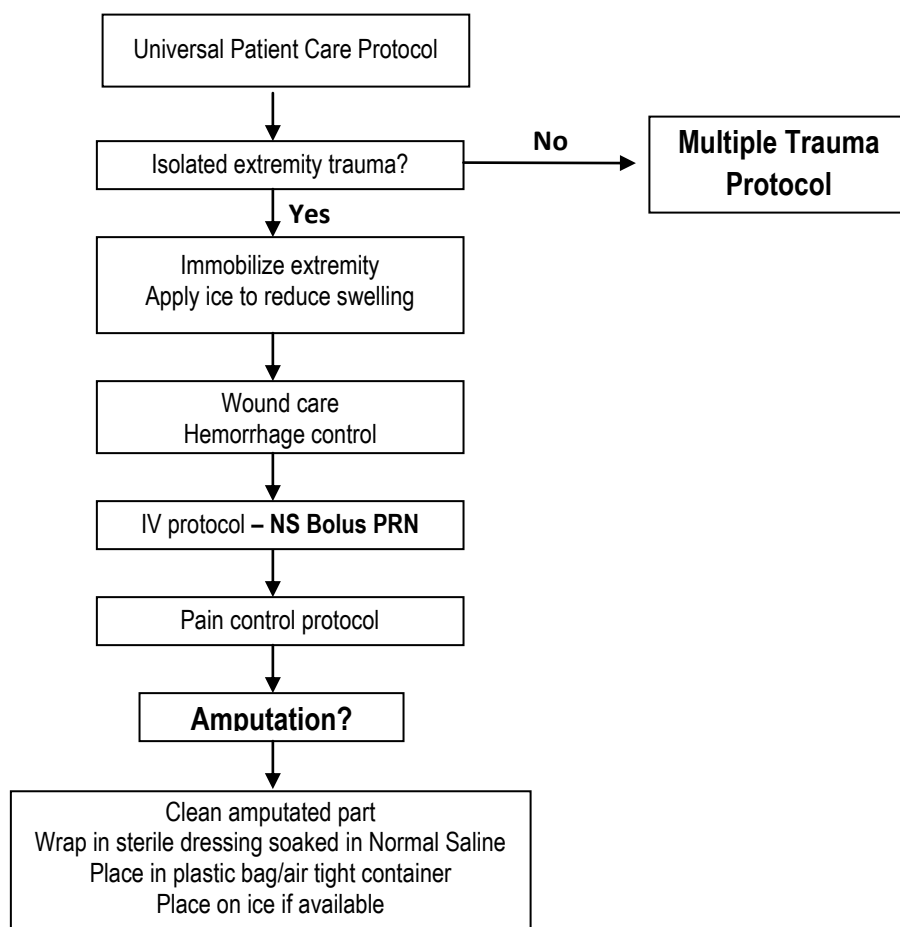


Pearls:

- **Avoid Afrin in patients who have a diastolic blood pressure > 110** or known coronary artery disease.
- It is better to overestimate the amount of blood lost with epistaxis.
- Anticoagulants including aspirin, ibuprofen, and even herbals (ginseng) can lead to increased bleeding.
- Firm pressure should be applied for compression. Pressure should not be applied over the bridge of the nose, but instead under the bony portion to effectively compress vessels. Do not release pressure prior to the 10min mark to check bleeding.
- Hypertensive patients will often not stop bleeding until BP is controlled.
- Re-bleeding is common with epistaxis.

EXTREMITY TRAUMA

History: <ul style="list-style-type: none"> Type of injury Mechanism – crush, penetrating, blast, amputation Time of injury Open vs. closed wound Contamination Medical history Medications 	Signs and Symptoms: <ul style="list-style-type: none"> Pain/swelling Deformity Altered sensation/function Diminished pulse/cap refill Decreased temperature Bleeding 	Differential Diagnosis: <ul style="list-style-type: none"> Abrasion Contusion Multi-trauma Fracture Dislocation Laceration Sprain/strain Amputation
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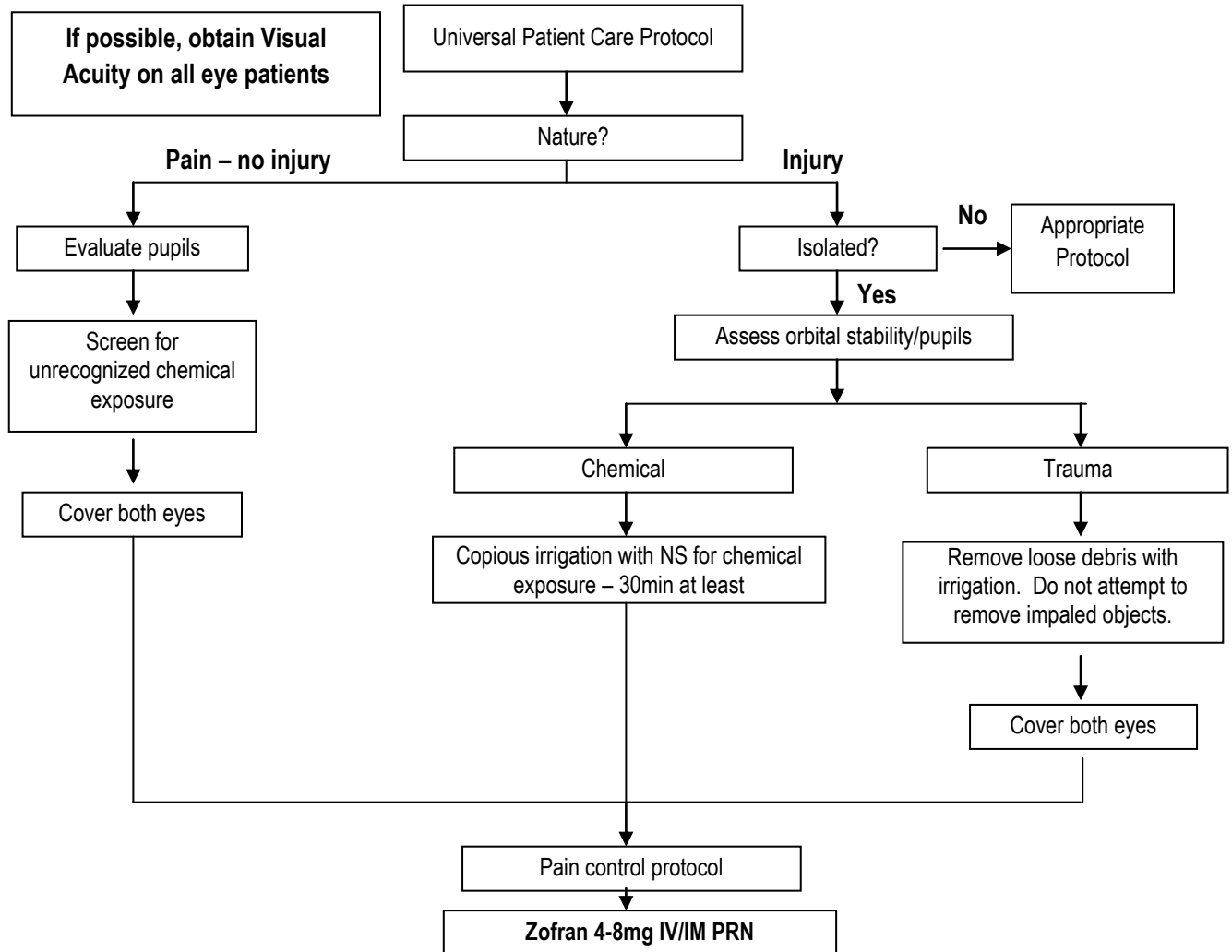


Pearls:

- In amputations – time is critical.
- Evaluate and document neurovascular status in all fractures/dislocations.
- Never attempt to reduce an open fracture.
- Blood loss can be severe and concealed in long bone fractures – especially the femur.
- Tourniquets should be used without hesitation to control major bleeding.

EYE INJURY / PAIN

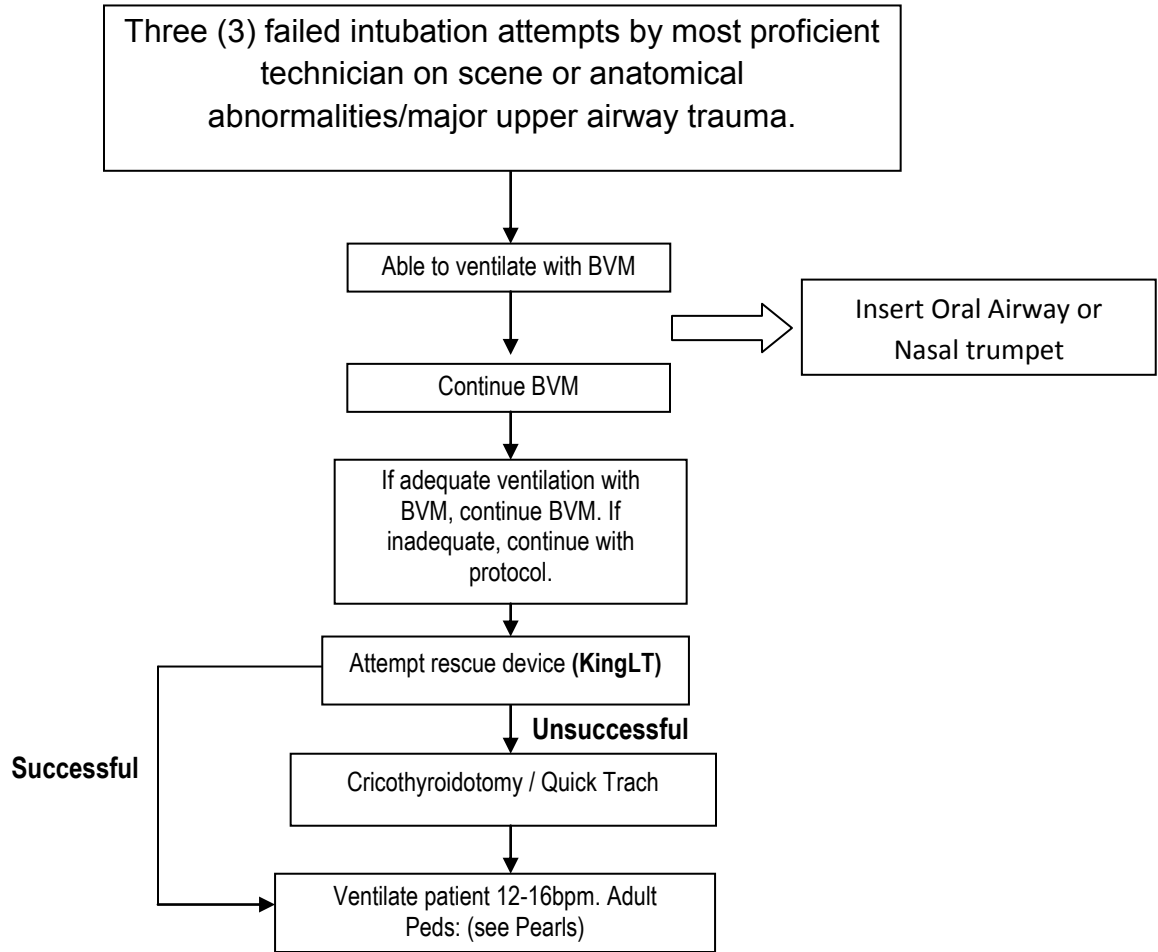
History: <ul style="list-style-type: none"> • Time of injury • Blunt/penetrating/chemical • Open vs closed • Involved chemicals • Wound contamination • Medical history • Tetanus status • Normal vision • Visual acuities 	Signs and Symptoms: <ul style="list-style-type: none"> • Pain, swelling, blood • Decreased visual acuity/blindness • Deformity/contusion • Foreign body • Excessive tearing 	Differential Diagnosis: <ul style="list-style-type: none"> • Abrasion/laceration • Globe rupture • Retinal detachment • Chemical/thermal burn • Infection • Orbital fracture • CNS event • Glaucoma • Retinal vessel occlusion • Iritis
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Pearls:

- Normal visual acuity can be present with severe eye injury.
- Covering both eyes prevents further injury/pain from consensual light reflex.
- Use rigid eye shields, not pads, for traumatic injuries. Can use a soft pad on unaffected eye.
- If globe is out of socket – do not attempt to replace. Cover with saline soaked gauze and protect from further injury.
- Copious irrigation is the cornerstone of treatment for chemical eye injuries. 30 min is the minimum amount of time to irrigate.

FAILED AIRWAY



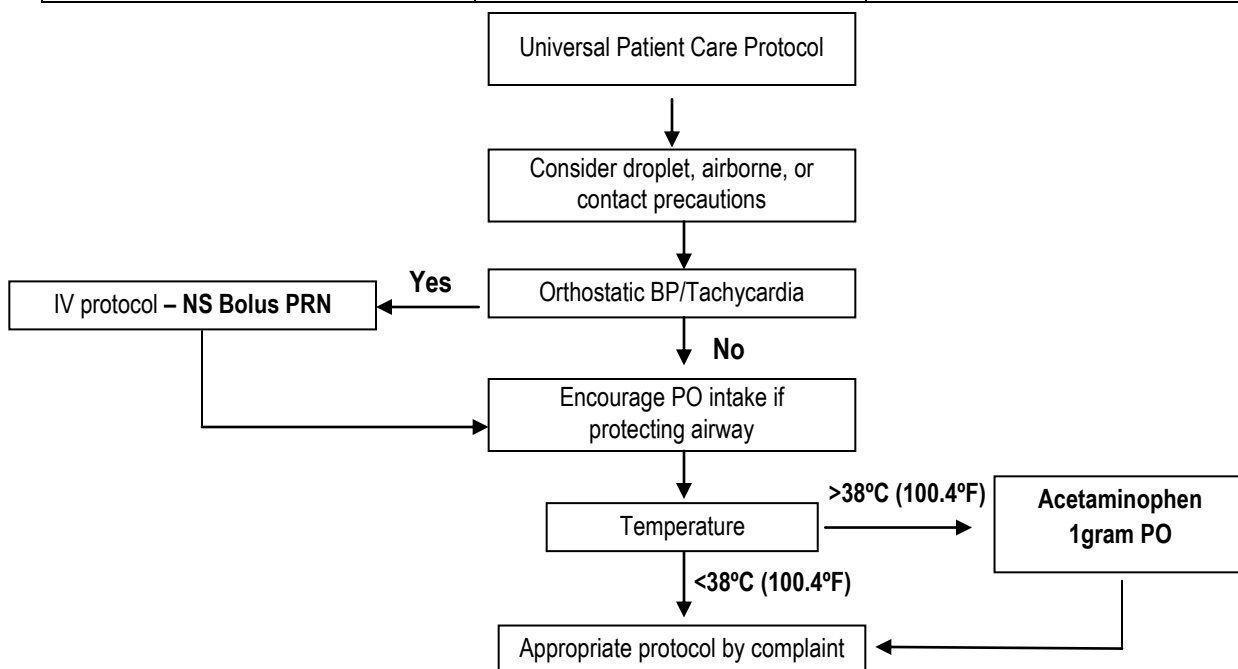
Pearls:

- Continuous pulse oximetry should be utilized in all patients with an inadequate respiratory function.
- Notify medical control as soon as possible of failed airway.
- Cricothyroidotomy can be performed by all RL1 medics once approved by medical director. This should be utilized quickly with severe airway trauma or inability to intubate.
- If suspicion of head, neck, or facial trauma, maintain cervical spine support (neutral position) and perform the jaw thrust maneuver.
- Contraindications for Oralpharyngeal Airway (OPA): conscious or semiconscious patient, severe facial trauma
- Contraindications for Nasopharyngeal Airway (Nasal trumpet): Intact gag reflex, Known esophageal disease, recent ingestion of caustic substances, severe facial trauma, possible nasal an adjacent fractures
- **PEDS: VENTILATORY RATE:** (breaths/minute)

Infant:	30-60	School-age child:	18-30
Toddler:	24-40	Adolescent:	12-16
Preschooler:	22-34		

FEVER / INFECTION

History: <ul style="list-style-type: none"> • Past medical history • Medications • Duration/severity of fever • Immunocompromise • Environmental exposure • Last antipyretic/dosage 	Signs and Symptoms: <ul style="list-style-type: none"> • Warm • Flushed • Diaphoretic • Chills Associated Symptoms: <ul style="list-style-type: none"> • Myalgias, cough, chest pain, headache, dysuria, abdominal pain, mental status change, rash, stiff neck 	Differential Diagnosis: <ul style="list-style-type: none"> • Infection/sepsis • Cancer/tumor/lymphoma • Medication/drug reaction • Connective tissue diseases • Hyperthyroidism • Heat stroke • Meningitis
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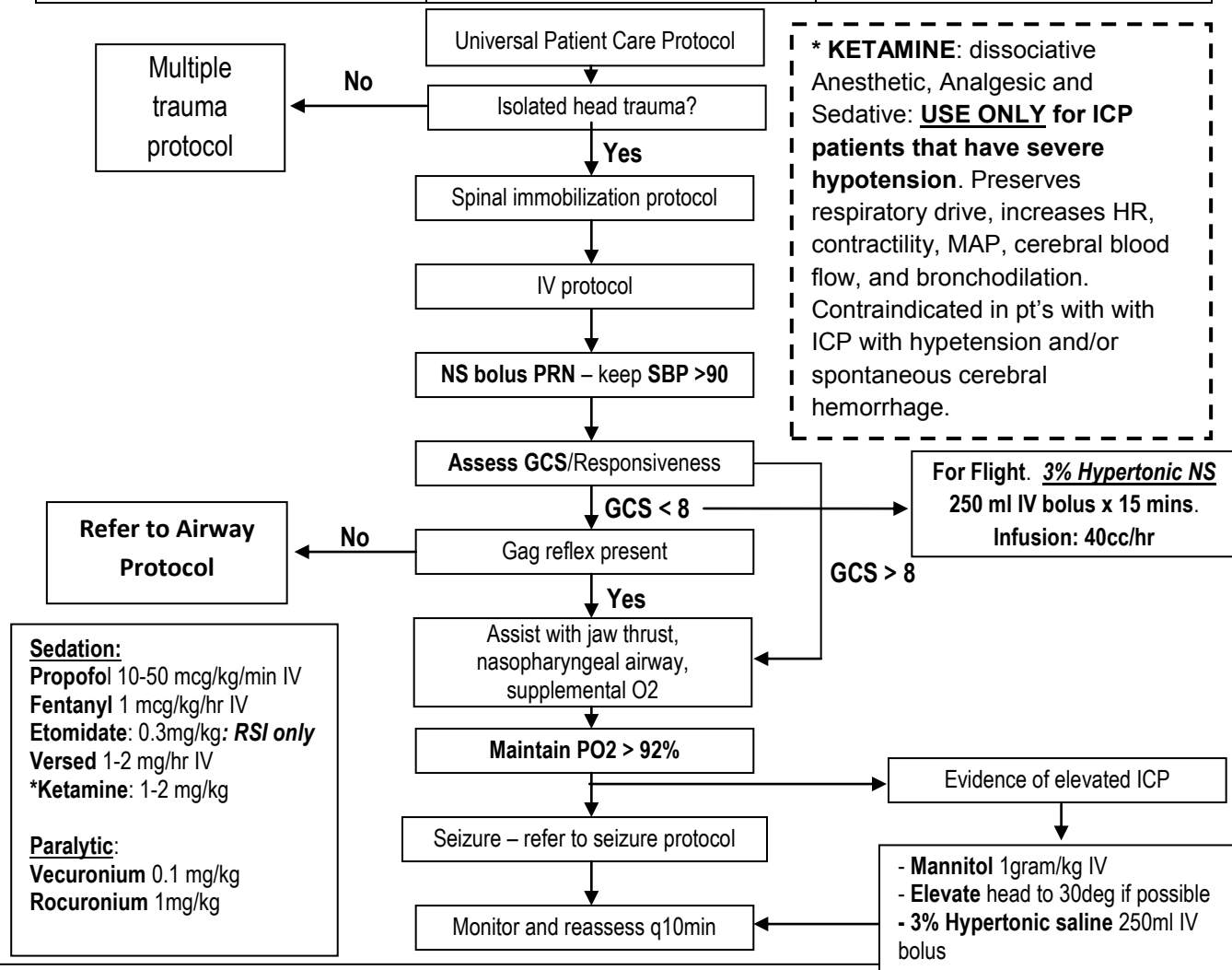


Pearls:

- Fever may not be present in immunocompromised, elderly, or those on immunosuppressive drugs.
- All fever is not due to infection – evaluate for environmental/thyroid/toxic etiology.
- Appropriate precautions should be used for personal protection when transporting patients with contagious disease:
 - Airborne: standard PPE plus N-95 mask and NRB or surgical mask on patient. Used for tuberculosis, measles, varicella, or other infections spread by droplets.
 - Droplet: Standard surgical mask for provider and patient. Use with: influenza, meningitis, mumps, streptococcal pharyngitis.
 - Contact: Standard PPE with strict hand-washing. Use with: MRSA, scabies, varicella-zoster.
- It is better to use more PPE than is necessary.
- Tylenol may also be given PR if suppository form available and patient not tolerant of PO medications.

HEAD INJURY

History:	Signs and Symptoms:	Differential Diagnosis:
<ul style="list-style-type: none"> Time of injury Mechanism: blunt/penetrating Loss of consciousness Bleeding Past medical history Medications 	<ul style="list-style-type: none"> Pain, swelling, bleeding Ecchymosis Deformity Altered mental status Respiratory distress/failure Vomiting 	<ul style="list-style-type: none"> Skull fracture Brain injury Epidural hematoma Subdural hematoma Subarachnoid hemorrhage Spinal injury Abuse

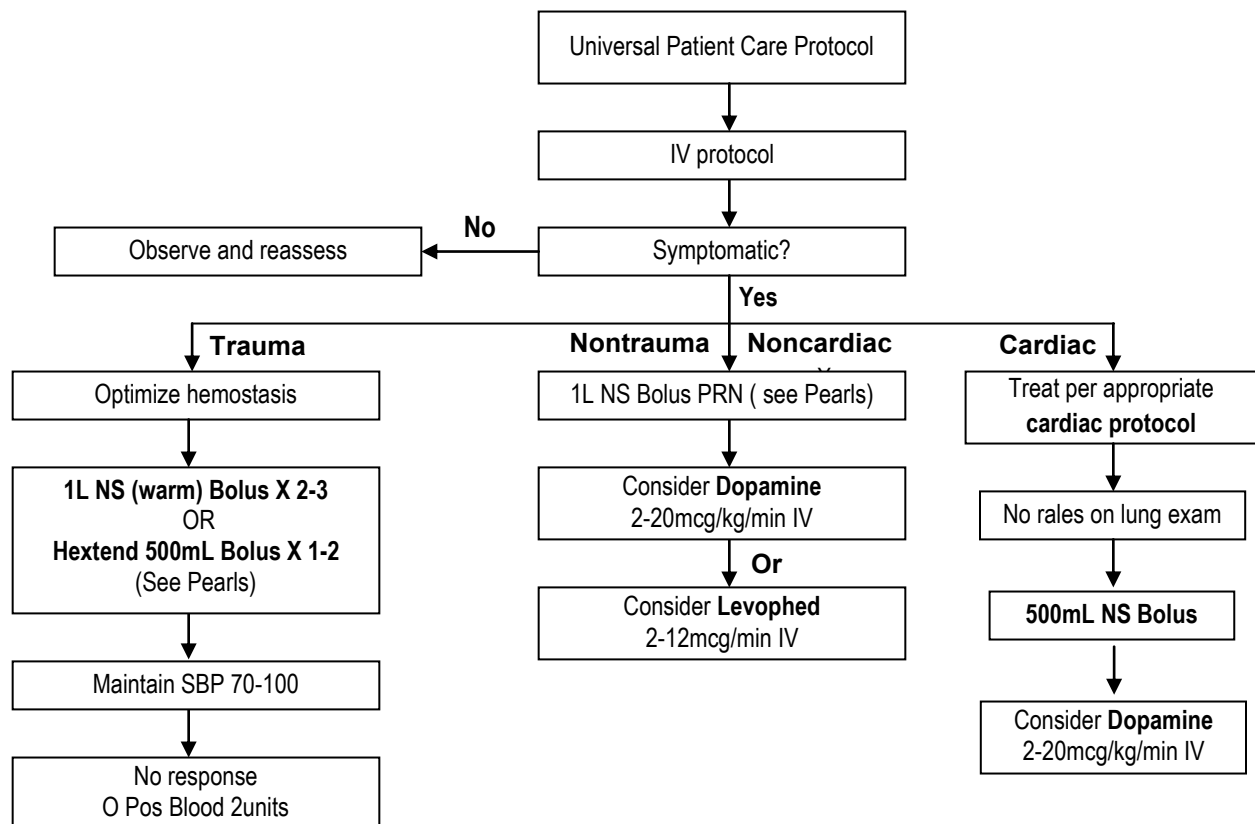


Pearls:

- Key to treatment of head injured patients is to prevent hypoxic insult. This is done by maintaining PO2 and maintaining cerebral perfusion pressure by preventing hypotension. Maintain PO2 and CPP by preventing hypotension. For Flight: **SBP > 90mm Hg, SpO₂ > 93%, MAP > 90 mm Hg**
- For clear signs of herniation, titrate CO₂ to 32-35 mm Hg on capnography. May hyperventilate bag with 100% O₂
- Evidence of increased ICP** – dilated, sluggish pupil(s), motor abnormalities, persistent/repetitive vomiting.
- Cushing's reflex** can be seen in a minority of patients (mostly peds) – hypertension, respiratory abnormalities, and bradycardia.
- Reassess GCS and mental status often to prevent missing subtle changes.
- Mannitol should be given as boluses – not a constant infusion. Do not use in hypotensive, dehydration or under-resuscitated patients

HYPOTENSION / SHOCK

History: <ul style="list-style-type: none"> Past medical history Medications Blood loss Fluid loss Infections Cardiac disease Allergic reaction Pregnancy status 	Signs and Symptoms: <ul style="list-style-type: none"> Restlessness/confusion Weakness/dizziness Tachycardia Pale, cool, clammy skin Delayed capillary refill Hypotension Coffee-ground emesis Vaginal bleeding Black, tarry stools Nausea/vomiting 	Differential Diagnosis: <ul style="list-style-type: none"> Shock: Hypovolemic, cardiogenic, septic, neurogenic, anaphylactic Cardiac arrhythmia Pulmonary embolus Tension pneumothorax Medication effect/OD Vasovagal episode
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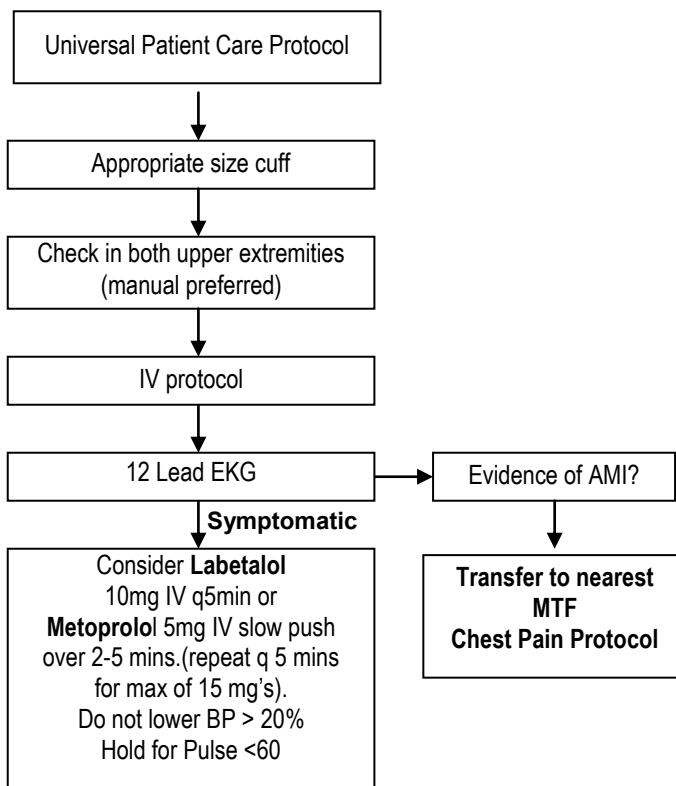


Pearls:

- Hypotension can be defined as a systolic blood pressure of less than 90mmHg.
- Fluid resuscitation for trauma should follow hypotensive resuscitation guidelines maintaining MAP > 65, but not raising the BP into the “normal” range, which may increase bleeding. Only give minimal “bolus” of IV fluids, to maintain MAP/SBP or change in mental status.
- Should treat patient prior to onset of shock if possible. Early signs of impending shock include tachycardia, orthostatic signs, and narrowing pulse pressure (systolic-diastolic BP).
- Consider all causes of shock and treat per appropriate protocol.
- Pressors have little to no role in trauma – optimize hemostasis and correct volume loss.

HYPERTENSION

History: <ul style="list-style-type: none"> • History of hypertension • Past medical history • Medications • Pregnancy status • Suspected drug use (cocaine, amphetamines) 	Signs and Symptoms: One of these: <ul style="list-style-type: none"> • Systolic BP 200 or higher • Diastolic BP 120 or higher Plus one of these: <ul style="list-style-type: none"> • Headache/altered mental status • Nosebleed • Blurred vision • Dizziness/Stroke symptoms • Chest pain 	Differential Diagnosis: <ul style="list-style-type: none"> • Primary CNS injury (Cushing's reflex) • Myocardial infarction • Aortic dissection • Pre-eclampsia / eclampsia • Toxin/Medication
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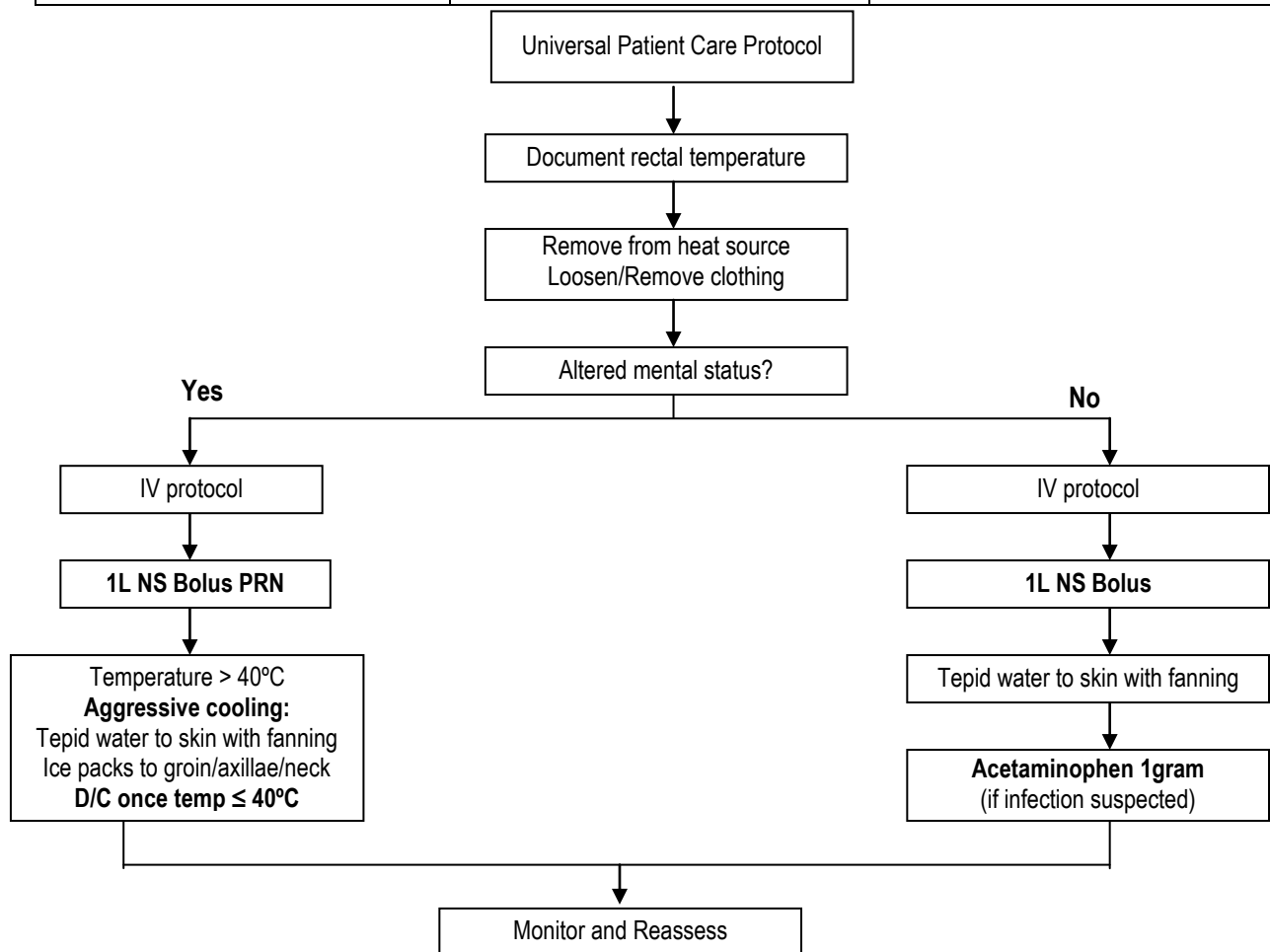


Pearls:

- Do not treat elevated blood pressure based on one set of vital signs.
- Improper cuff size and equipment malfunction are common reasons for abnormally high readings.
- If patient has none of the above symptoms of hypertensive emergencies – they do not require treatment of their blood pressure.
- In setting of stroke – do not treat blood pressure unless SBP>220 and/or DBP > 120 or signs of end-organ involvement. Elevated BP required to maintain perfusion during a stroke.
- Only lower BP approximately 20% with slow, titrated doses – hypertensive patients often need elevated BP to maintain organ/CNS perfusion.
- **Labetalol is contraindicated in patients with severe asthma/COPD. In these patients, NTG can be given to lower BP if absolutely necessary.**
- **Metoprolol is contraindicated for CHF, Acute PE, bronchospasms, bradycardia, hypotension, hx of asthma and thyrotoxicosis.**

HYPERTHERMIA

History: <ul style="list-style-type: none"> • Exposure to increased temperature/humidity • Past medical history • Medications • Increased activity • Poor PO intake • Fatigue/muscle cramping • Illicit substance/toxin 	Signs and Symptoms: <ul style="list-style-type: none"> • Altered mental status • Loss of consciousness • Hot/dry or sweaty skin • Hypotension or shock • Seizure • Nausea/vomiting 	Differential Diagnosis: <ul style="list-style-type: none"> • Infection • Dehydration • Thyroid storm • Medications/Toxin • Delirium Tremens • Heat cramps • Heat exhaustion • Heat stroke • CNS lesions or tumors
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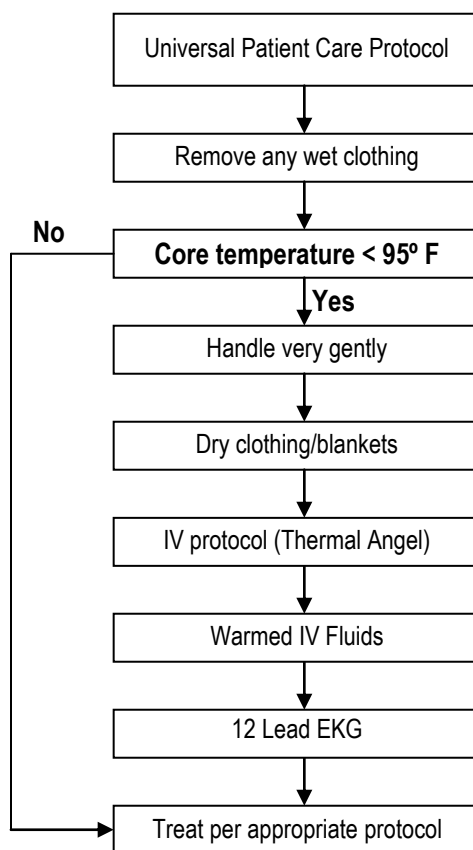


Pearls:

- Groups at elevated risk for heat emergencies: Elderly, very young, highly active.
- Use of alcohol, cyclic antidepressants, phenothiazines, and anticholinergic medications increase risk.
- Cocaine, Ecstasy, Amphetamines, and Aspirin toxicity can all raise body temperature.
- Sweating does not exclude heat stroke/heat illness.
- Use of cold water/rapid cooling of extremities may lead to vasoconstriction and some heat retention. Use tepid water and fans to cool.
- In conscious patients that can protect their airway, encourage intake of PO fluids and electrolytes if heat illness suspected as cause.

HYPOTHERMIA

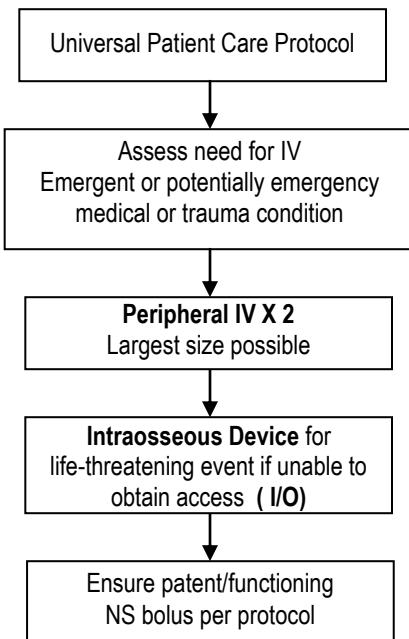
History: <ul style="list-style-type: none"> • Past medical history • Medications • Exposure to environment • Extremes of age • Drug use • Infections/sepsis • Length of exposure 	Signs and Symptoms: <ul style="list-style-type: none"> • Cold, clammy • Shivering/lack of shivering • Mental status changes • Extremity pain/numbness • Bradycardia/arrhythmia • Hypotension or shock 	Differential Diagnosis: <ul style="list-style-type: none"> • Sepsis • Environmental exposure • Hypoglycemia • CNS dysfunction • Toxic ingestion
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Pearls:

- “No patient is dead until they are warm and dead.”
- Hypothermia defined as core temperature < 95° F (35°C).
- With temperatures < 31°C (88°F) ventricular fibrillation is common. Cardiac muscle becomes very irritable as temperature drops and rough handling may cause V. fib. Therefore, these patients must be handled/moved gently.
- With temperatures below 30°C (86°F) shivering ceases – removing an important heat production source.
- Pulse may be very slow in hypothermic patients – should wait at least one minute to feel pulse.
- Arrhythmias at temperature > 30°C treated similar to normothermic patients with the addition of active re-warming. At temperatures < 30°C one defibrillation can be attempted, but further attempts/meds withheld until temp > 30°C.

IV PROTOCOL

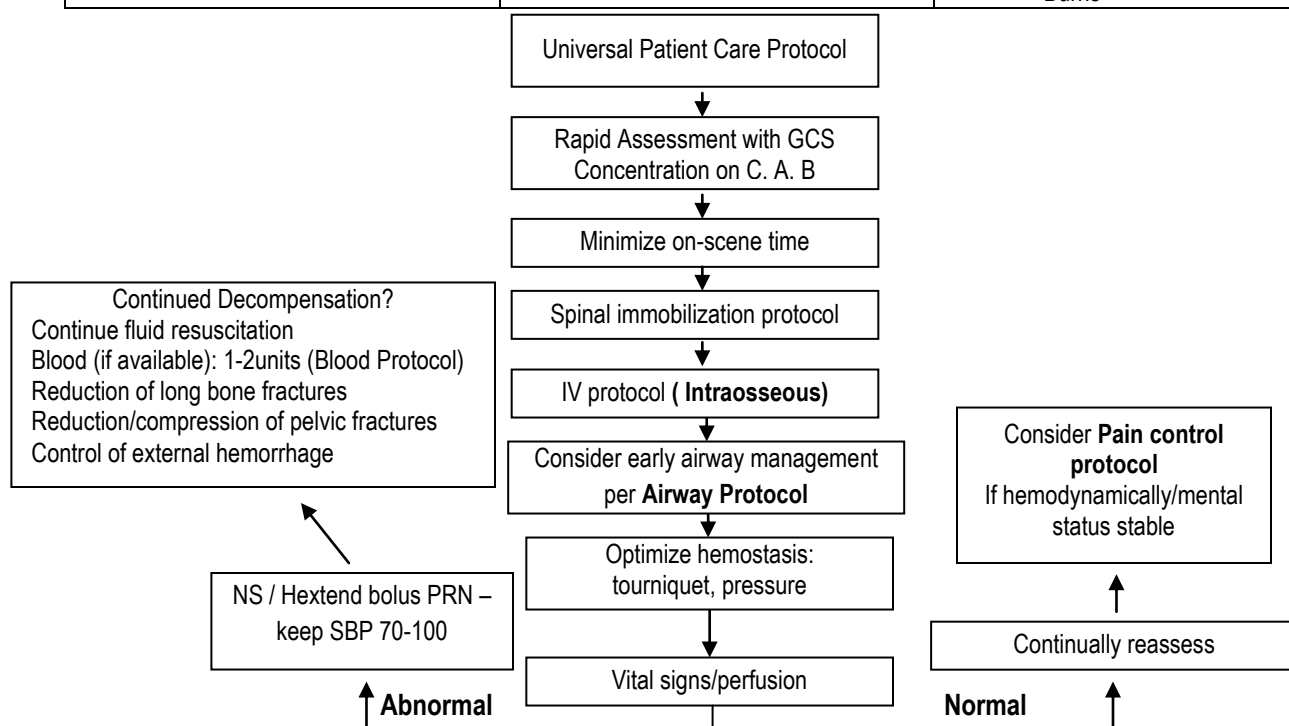


Pearls:

- Any prehospital fluids or medications approved for IV use may be given through an intraosseous line – including blood products.
- External jugular lines can be attempted for life-threatening events with no peripheral access.
- All trauma patients or potentially ill patients should have **AT LEAST TWO** functioning IV/IO lines whenever possible.
- Upper extremity IV sites are preferable to lower extremity IV sites.
- Intraosseous confirmed in place by good flush/good flow – may not aspirate blood. Utilize Easy IO or FAST I.

MULTIPLE TRAUMA

History: <ul style="list-style-type: none"> • Time of injury • Damage to vehicle/compartments • Patient location in vehicle • Others injured or dead • Restraint/protective equipment • Past medical history • Medications 	Signs and Symptoms: <ul style="list-style-type: none"> • Pain, swelling, bleeding • Ecchymosis • Deformity • Altered mental status • Respiratory distress/failure • Vomiting • Hypotension/shock • Cardiac arrest 	Possible Injuries/Diagnoses: <ul style="list-style-type: none"> • Tension pneumothorax • Flail chest • Pericardial tamponade • Open chest wound • Hemothorax • Intra-abdominal injury/bleeding • Pelvis/long-bone fracture • Spine/Spinal cord injury • Head injury • Extremity fracture/dislocation • HEENT injuries • Hypothermia • Burns
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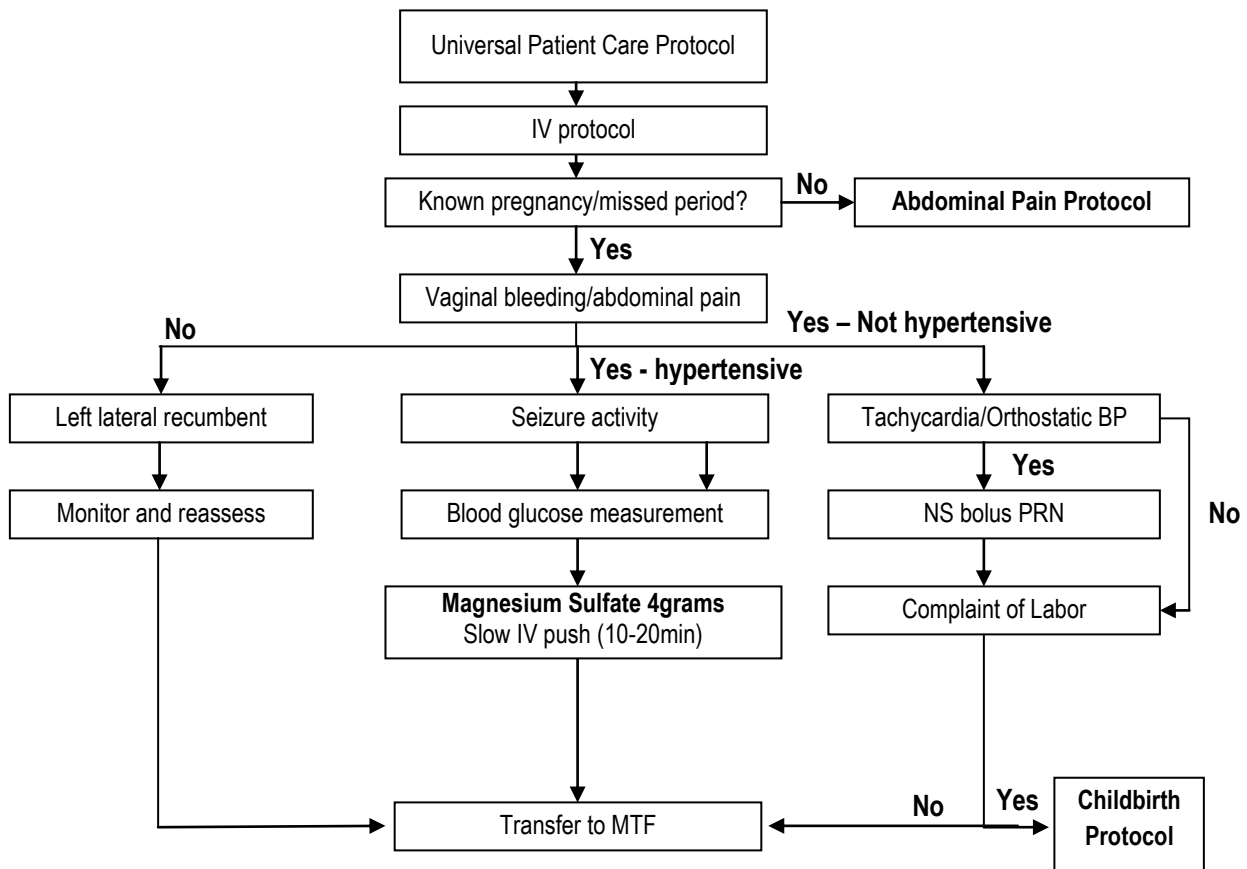


Pearls:

- Severe extremity bleeding should be immediately addressed with a tourniquet.
- Fluid resuscitation encouraged to stabilize patient with “ IV bolus”. However, goal is not to return BP to “normal” level as this may be detrimental. Goal is to control BP in hypotensive range until definitive hemostasis can be obtained. MAP >65, SBP 70-100. Monitor pulse and change in mental status.
- If available, O pos (male) or O neg (female) blood products should be given if NS / Hextend bolus fails to improve hemodynamics.
- Narrowed pulse pressure should prompt resuscitation – do not wait for decompensation to ensue.
- Stabilize pelvic fractures with sheet/binder and tie feet together. Up to 4-6L of blood can be hidden in pelvis.

OBSTETRIC EMERGENCY

History: <ul style="list-style-type: none"> • Past medical history • Hypertension history • Prenatal care • Gravida / para • Single/multiple gestation 	Signs and Symptoms: <ul style="list-style-type: none"> • Vaginal bleeding • Abdominal pain • Seizure • Hypertension • Headache • Visual disturbance 	Differential Diagnosis: <ul style="list-style-type: none"> • Pre-eclampsia/Eclampsia • Placenta previa • Abruptio placentae • Spontaneous abortion
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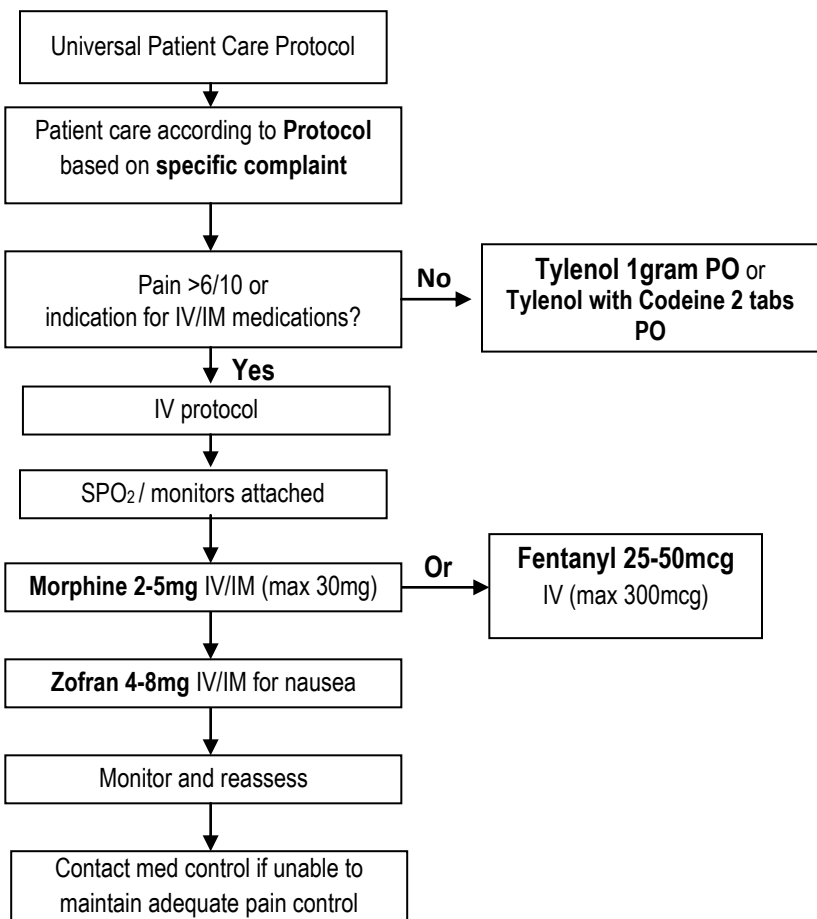


Pearls:

- Severe headache, vision changes, and/or RUQ pain may indicate pre-eclampsia. Addition of seizure activity to this signifies eclampsia.
- The best life support for the fetus is to resuscitate the mother.
- All pregnant/suspected pregnant patients should be kept in the left lateral decubitus position or have padding placed below the right hip to keep pressure off of the IVC.
- Use caution when using magnesium – it can lead to cardiorespiratory collapse with hypotension and decreased respiratory drive.
- Treat all hypertensive patients as if they are pre-eclamptic despite any prior history of hypertension.

PAIN CONTROL

History:	Signs and Symptoms:
<ul style="list-style-type: none"> • Age • Location of pain • Duration • Severity • Past medical history • Medications • Allergies 	<ul style="list-style-type: none"> • Tachycardia • Diaphoresis • Elevated Blood Pressure

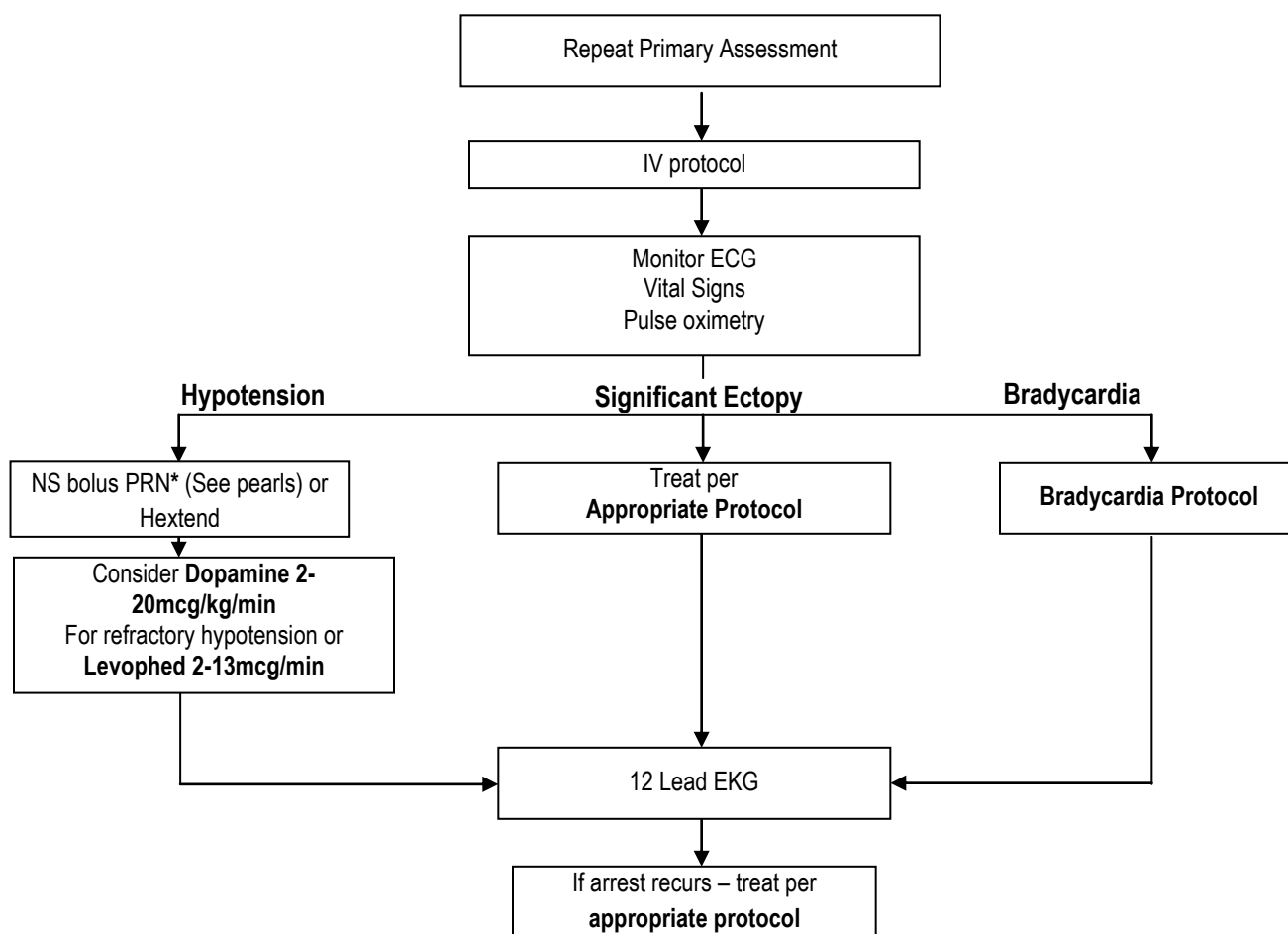


Pearls:

- Document patient's medications and all allergies prior to administration of medications.
- PO medications should not be used in any patient with altered mental status or anyone in whom surgery is anticipated.
- **Narcotic pain medications can be reversed with Narcan 0.4-2mg IV. Benzodiazepine reversal (Fentanyl/Ativan) with Flumazenil 0.2-0.5mg IV (Max dose 3mg x 1 hour)**
- Start with low dosage of pain medications and titrate upward to desired effect.
- Morphine will cause decreased BP through various drug effects. Fentanyl may also lower BP, but less so than morphine.
- Morphine auto-injectors may be used if available in place of IV administration.

POST-RESUSCITATION

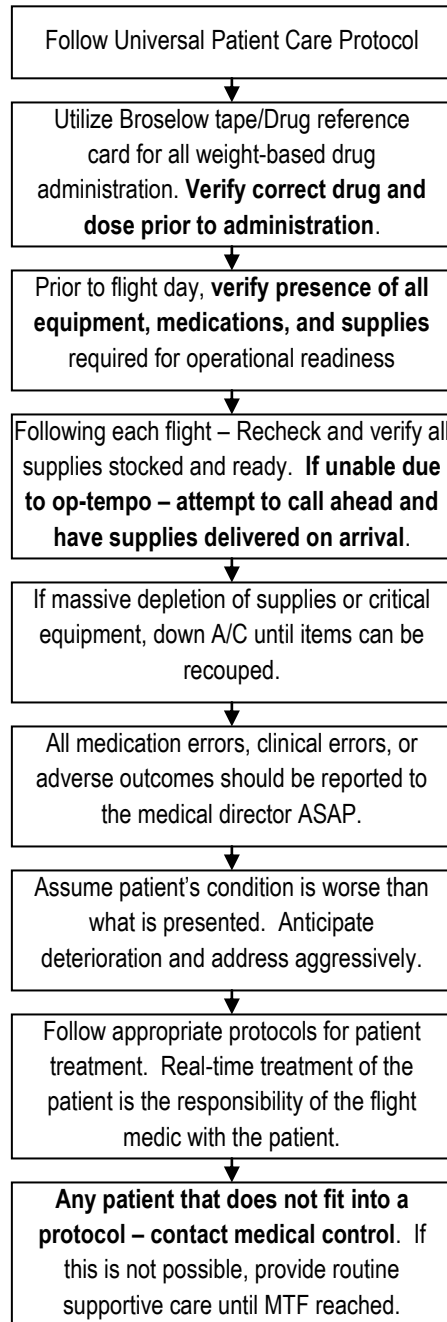
History: <ul style="list-style-type: none"> Respiratory arrest Cardiac arrest 	Signs and Symptoms: <ul style="list-style-type: none"> Return of spontaneous circulation Pulse Respirations 	Differential Diagnosis: <ul style="list-style-type: none"> Continually address primary pathology associated with arrest
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Pearls:

- Hyperventilation may cause hypotension and/or recurrence of cardiac arrest in the post-resuscitation phase and must be avoided.
- Most patients will require ventilatory assistance in the post-resuscitative phase
- In non-airway controlled patients, it is important to prevent aspiration following resuscitation. For this reason, patients should be rotated onto their side (non-spinal immob.) or be closely monitored in case vomiting occurs.
- Dopamine should be started at a low dose (5mcg/kg/min)** and titrated up to maintain a SBP > 90. The same applies to Levophed.
- *Trauma patients** post-resuscitation should have fluid resuscitation consistent with hypotensive resuscitation guidelines. Consider Hextend 500ml bolus 1-2 if patient has not received Hextend

PATIENT SAFETY

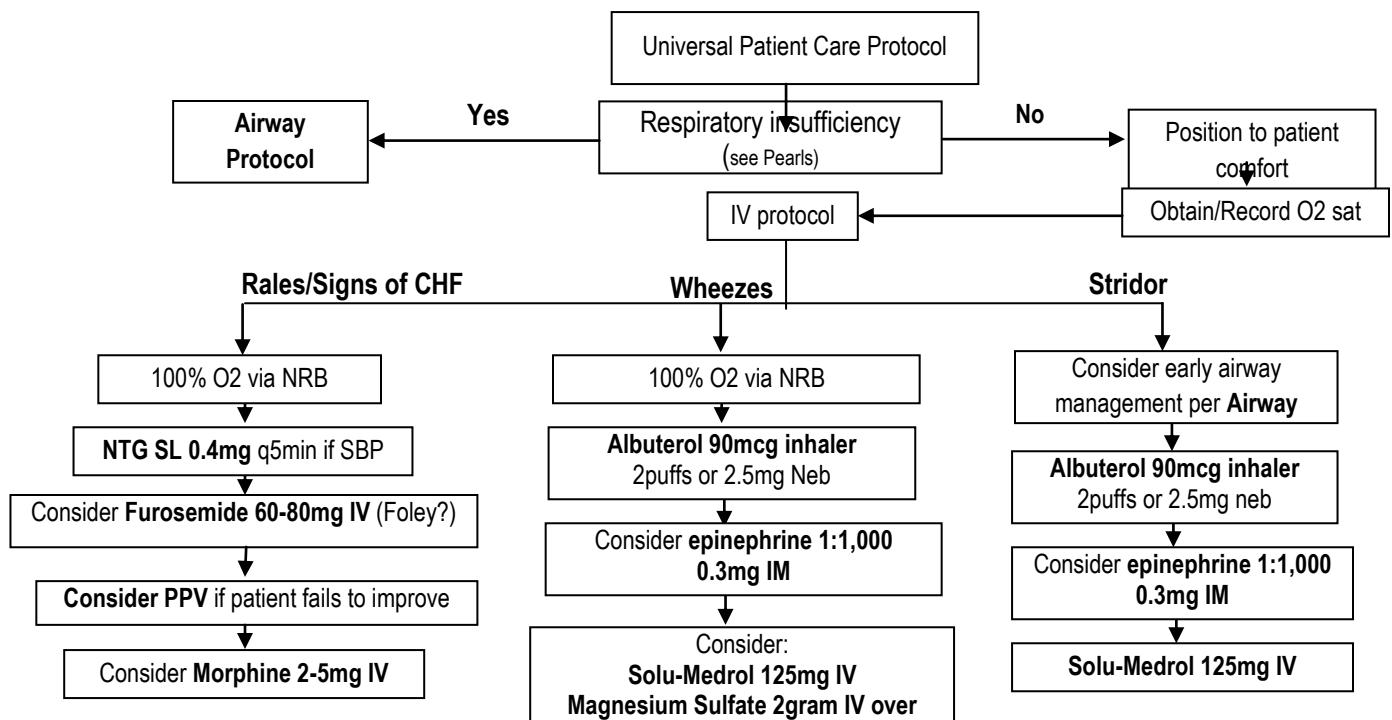


Pearls:

- Supportive care for all patients includes routine monitoring, IV protocol, O2/airway support, and IV fluid resuscitation as required to maintain “normal” vital signs.
- Always check and double-check medications and dosage prior to administration. Record any patient allergies prior to administration of drugs.
- Check medical supplies and equipment prior to accepting/flying mission. Arrival on scene without proper equipment will result in inability to provide en route care and adverse outcomes.
- Any medication/clinical errors or other care-associated concerns should be brought to the attention of the medical officer/director immediately following the mission or at earliest possible time.

RESPIRATORY DISTRESS

History: <ul style="list-style-type: none"> • Past medical history • Prior episodes/treatments • Medications • Onset • Smoke inhalation • Toxic exposure 	Signs and Symptoms: <ul style="list-style-type: none"> • Shortness of breath • Pursed lip breathing • Decreased ability to speak • Tachypnea / Hyperpnea • Wheezing / rhonchi / rales • Use accessory muscles • Fever/cough • Tachycardia • Absent breath sounds (emergent) 	Differential Diagnosis: <ul style="list-style-type: none"> • Asthma • Anaphylaxis/Allergy • Aspiration • COPD • Pleural effusion • Pneumonia • Congestive heart failure/Cardiac • Pulmonary embolus • Pneumothorax • Pericardial tamponade • Hyperventilation • Toxic inhalation (cyanide, CO, etc.)
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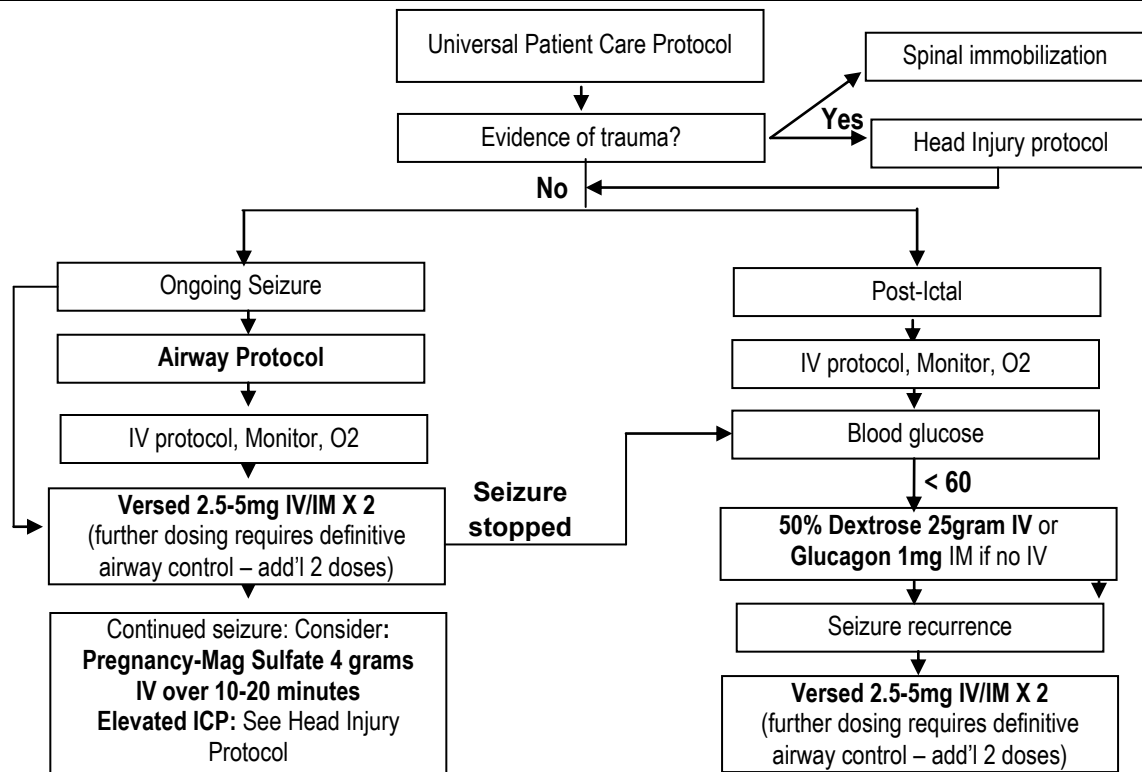


Pearls:

- **Signs of respiratory insufficiency:** Cyanosis, altered mental status/loss of consciousness, fatiguing, inability to speak, or inability to maintain O2 sat >90% with supplemental O2.
- Use albuterol/epinephrine with caution in patients with history of coronary artery disease/elderly as it may increase cardiac workload.
- Albuterol can be administered with spacer or short (6") section of ventilator tubing to increase delivery if patient unable to perform action appropriately. No max dose of albuterol, repeat as needed for continued wheezing.
- Lack of abnormal breath sounds does not always signify improvement. As respiratory status worsens, there may be inadequate air movement to produce these sounds.
- CHF patients can be volume depleted – concentrate on NTG use after 1st dose of furosemide.
- Do not use furosemide in patients with history of allergy to sulfa drugs.
- An EKG should be performed and patient on cardiac monitor prior to administration of epinephrine.

SEIZURE

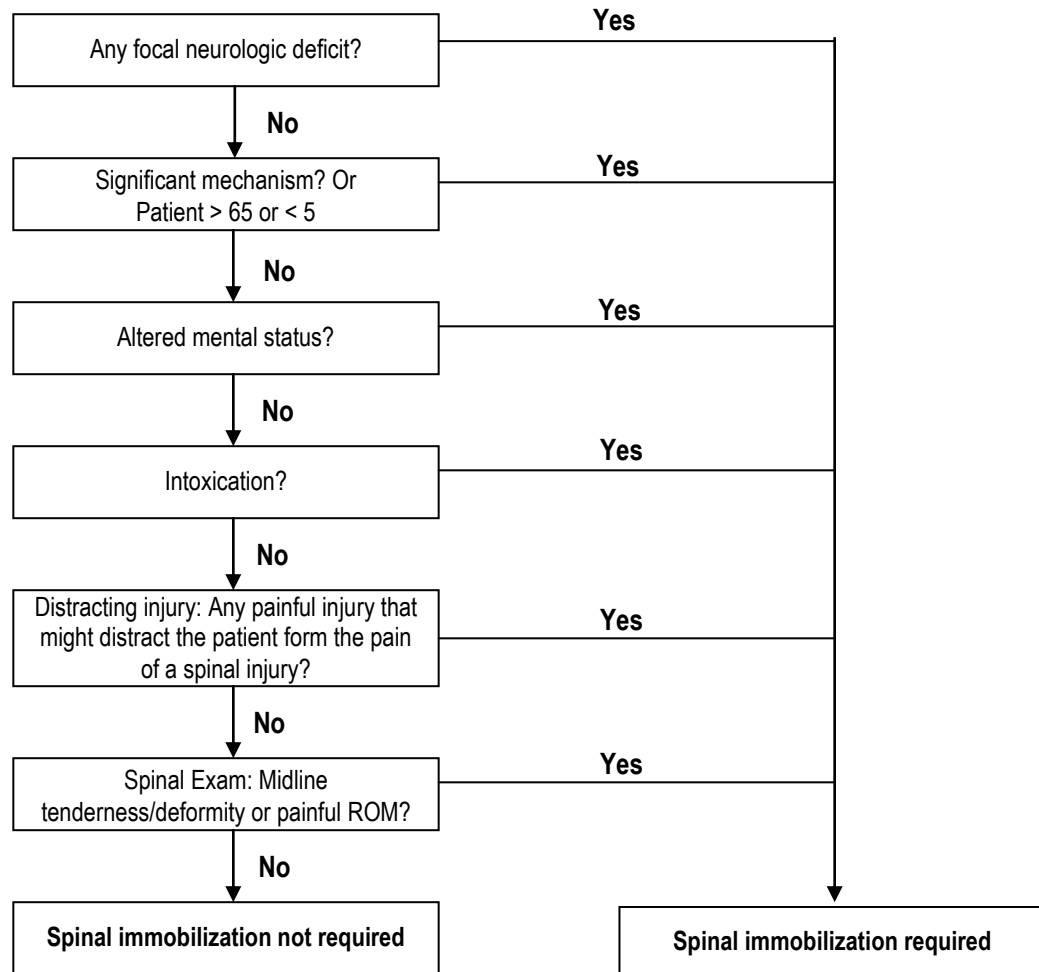
History: <ul style="list-style-type: none"> Reported/witnessed seizure activity Previous seizure history Medical alert tag Medications Past medical history Trauma Diabetes Pregnancy status 	Signs and Symptoms: <ul style="list-style-type: none"> Decreased mental status Seizure activity Somnolence Incontinence Evidence of trauma Loss of consciousness Oral injuries (tongue, buccal) 	Differential Diagnosis: <ul style="list-style-type: none"> CNS trauma Tumor/mass/infection Metabolic Hypoxia Electrolyte abnormality Drugs/toxins Alcohol/Benzodiazepine withdrawal Stroke Eclampsia Hyperthermia Hypoglycemia
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Pearls:

- Status epilepticus defined as seizure > 15min or two or more successive seizures without a period of consciousness/recovery. This is a true emergency requiring rapid airway control, treatment, and transport to nearest suitable MTF.
- Paralysis for airway control does not stop seizure activity** – only hides it. Seizure is a CNS electrical phenomenon and damage is still being done even when no muscular activity seen due to paralysis.
- Anticipate further seizure activity/recurrence and monitor continually.
- Assess probability of toxin, occult trauma, abuse, or substance use.
- Be prepared to assist with ventilations with the use of versed. If airway controlled and ventilating well – may give total of 4 doses of Versed.
- In **pregnant patients, Magnesium should be attempted first line to abort seizures**. Versed should only be used if this fails (pregnancy class D).
- Alcohol Withdrawal or Malnutrition (**Thiamine 100mg IV**)

SPINAL IMMOBILIZATION

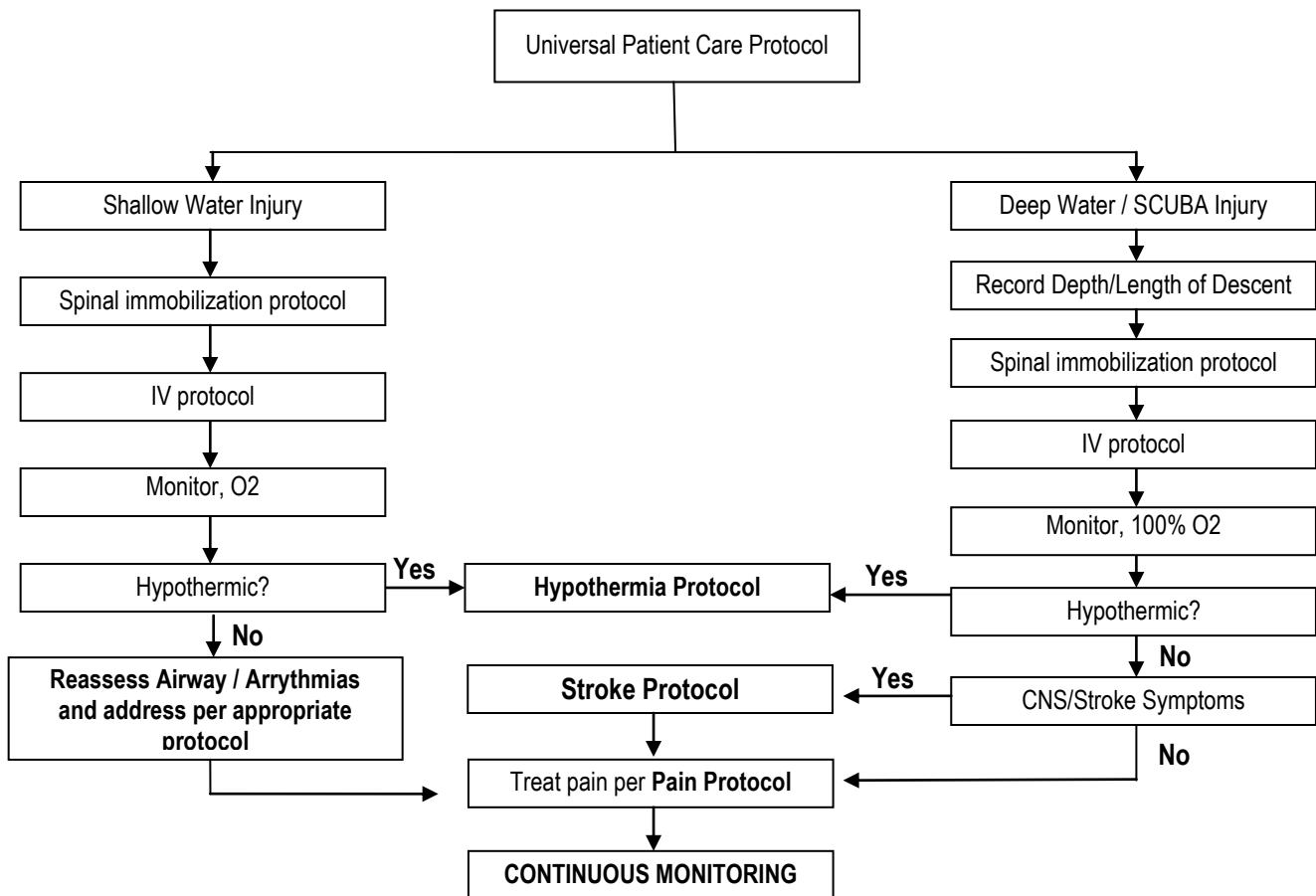


Pearls:

- While controlling C-spine, roll patient and palpate spine for tenderness, deformity, or step-off.
- Range of motion should never be tested in patients with midline tenderness/deformity. If these are not present – testing requires patient to touch chin to chest, fully extend, and rotate fully from side to side without pain.
- Do not attempt to quantify patient's injury as distracting. If it is hurting them severely regardless of type – it is distracting.
- It is always safer to immobilize if in doubt.
- A cervical collar does not provide adequate C-spine immobilization by itself – head blocks (commercial or field expedient) should be utilized and the patients head secured to them.

SUBMERSION INJURY

History: <ul style="list-style-type: none"> • Past medical history • Medications/Allergies • Submersion in water – salt/fresh • Suspicion of trauma • Duration of immersion • Temperature of water • Drug/alcohol use 	Signs and Symptoms: <ul style="list-style-type: none"> • Unresponsive • Mental status changes • Hypoxia • Cyanosis • Hypothermia • Vomiting • Coughing 	Differential Diagnosis: <ul style="list-style-type: none"> • Trauma (esp. C-spine) • Submersion injury • Pressure injury (SCUBA)
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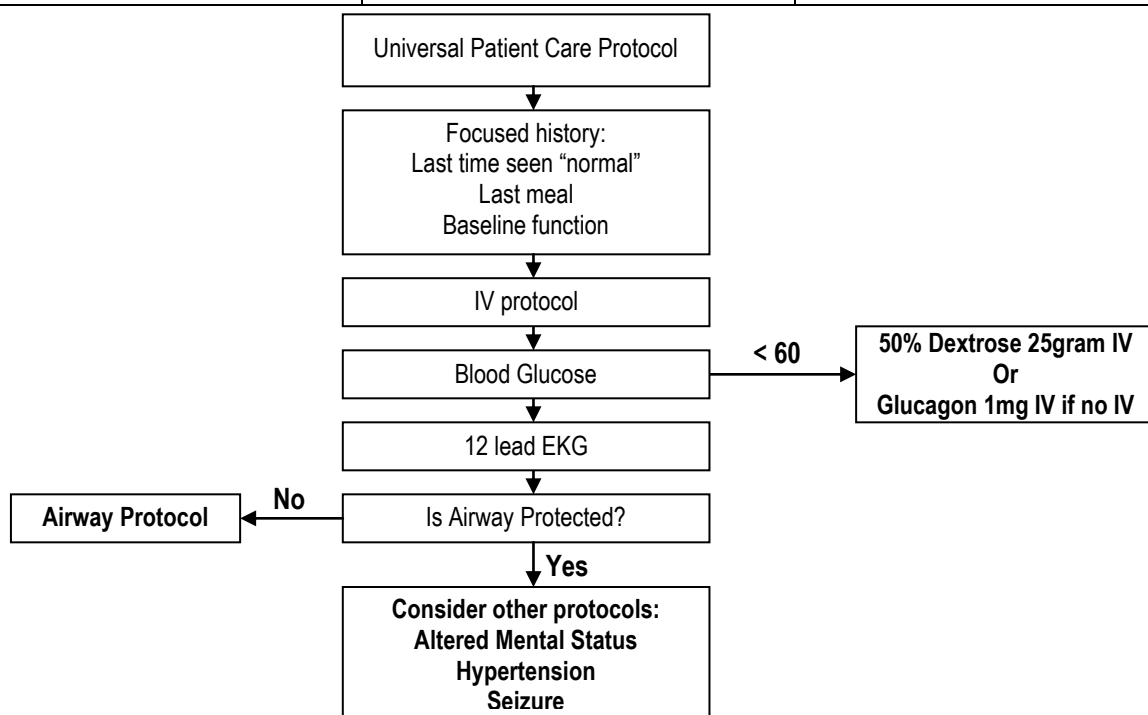


Pearls:

- Rapid hypothermia from cold water immersion in children has resulted in survival despite prolonged downtime – resuscitate per appropriate protocols and rapidly transport. This has not been seen in adults.
- All near-drowning victims should be transported for evaluation due to potential for worsening respiratory status over next several hours.
- Drowning is the leading cause of death among would-be rescuers.
- Head-first diving injuries often associated with unstable Jefferson fracture (burst fracture of C1) due to axial load. Patients found with suspicion of this type of injury should have early and careful C-spine immobilization.
- Patients with SCUBA injuries/Decompression injuries involving the CNS or Respiratory system (stroke symptoms, pulmonary embolism symptoms) should be treated with 100% O2 and delivered to a facility with a hyperbaric chamber, if possible.
- Altitude should be restricted in patients suffering from decompression illnesses to prevent worsening. Should remain <1000' AGL/10000' MSL whenever possible.

SUSPECTED STROKE / TIA

History: <ul style="list-style-type: none"> • Past medical history • Medications/Allergies • Previous episodes/Stroke • History of trauma • Last meal • Onset of symptoms/last time "normal" • Toxin/Drug ingestion 	Signs and Symptoms: <ul style="list-style-type: none"> • Altered mental status • Weakness/paralysis • Blindness or other sensory loss • Aphasia / dysarthria • Syncope • Vertigo/dizziness • Vomiting • Headache • Seizures 	Differential Diagnosis: <ul style="list-style-type: none"> • Transient ischemic attack • Stroke • Seizure • Hypoglycemia • CNS infection/mass • Trauma • Metabolic
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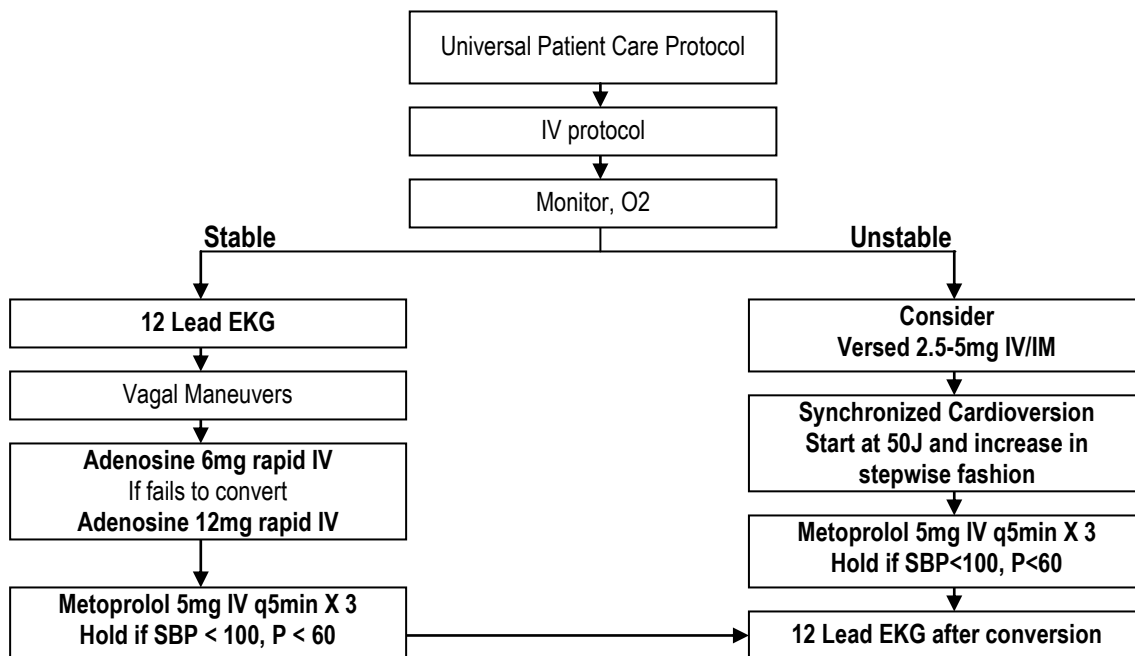


Pearls:

- Duration of symptoms should be determined as accurately as possible. Family members/colleagues can be helpful. If pt awoken with symptoms – onset time est. from last time patient was seen "normal".
- Be alert for airway problem/d risk of aspiration. If concerned, request intubation before departure.
- Hypoglycemia can mimic stroke/TIA. May present with focal neurologic deficit, especially in the elderly.
- EKG should be obtained in all patients to evaluate for arrhythmia – especially atrial fibrillation.
- All TIAs should be transferred for evaluation even if symptoms abated – these patients have 10% risk of stroke within 30 days.
- Aspirin should not be given to patients for suspected stroke. Aspirin use is a contraindication to the use of thrombolytics for stroke.
- All strokes/TIAs are not associated with motor findings. Although uncommon, pure sensory strokes can occur. More frequently, very subtle motor abnormalities are present that the patient may not note
- **Systolic >220 or Diastolic 121-140: Labetalol 10-20 mg IV for 1-2 mins.** May repeat or double q 10 mins for a maximum dose of 300mg. Aim for 10-15% reduction in blood pressure.
- **Systolic 180-230 or Diastolic 105-120: Labetalol 10 mg IV for 1-2 minutes.** May repeat or double q 10 mins to max dose of 300mg. For additional info: See ACLS Acute Coronary Syndromes and Stroke.

SUPRAVENTRICULAR TACHYCARDIA

History: <ul style="list-style-type: none"> • Past medical history • Prior episodes/treatments • Medications/Allergies • Onset • Caffeine, nicotine use • Toxic exposure • Syncope/dizziness • Chest pain/Shortness of breath 	Signs and Symptoms: <ul style="list-style-type: none"> • Shortness of breath • Chest pain • Rapid heart rate/palpitations • Dizziness • Anxiety 	Differential Diagnosis: <ul style="list-style-type: none"> • Pre-excitation syndrome (Wolf-Parkinson-White syndrome) • Valvular heart disease • Sick sinus syndrome • Myocardial infarction • Electrolyte imbalance • Sinus tachycardia/Atrial flutter • Hypoxia • Drug overdose/toxin • Hyperthyroidism
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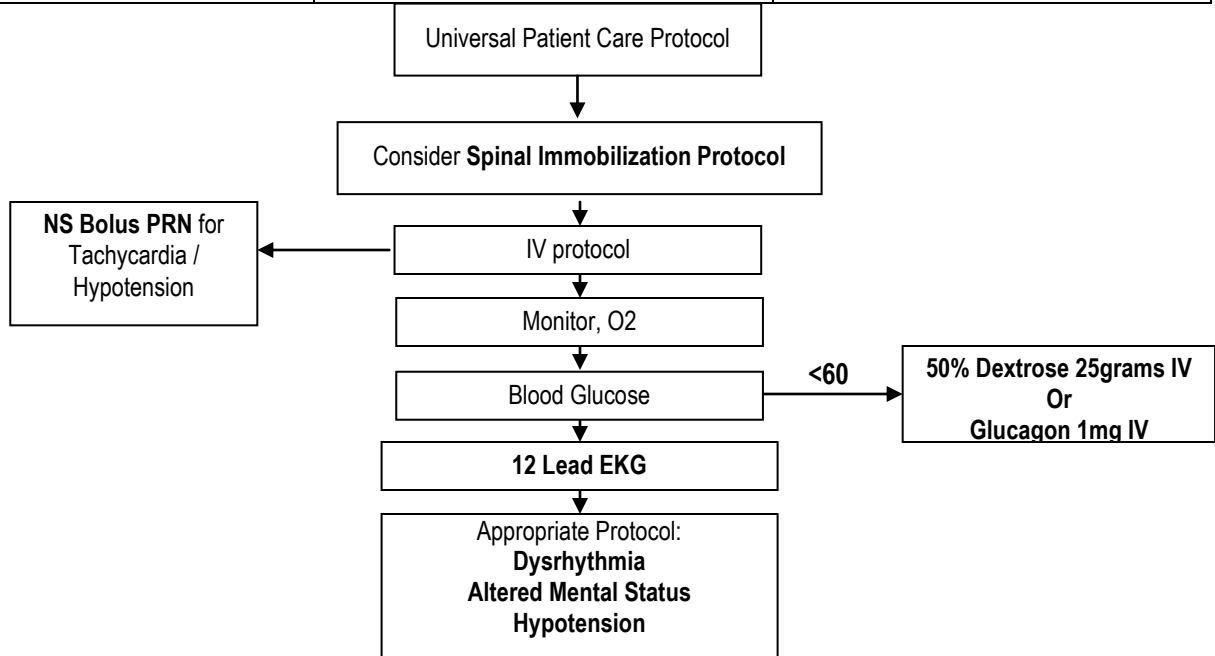


Pearls:

- Evidence of unstable patient includes **ANY: chest pain, altered mental status, and hypotension**. These patients should have immediate synchronized cardioversion. Sedation may be administered, but should not significantly delay cardioversion.
- All patients should be warned of discomfort/feeling of heart stopping prior to adenosine administration.
- Adenosine should be given with the “2 syringe technique” – one with adenosine and the other with the saline flush. These should be attached to a 2 port IV adapter and flush should immediately follow drug. IV should be as proximal as possible and arm elevated afterward.
- Continuous monitoring required for all patients.
- Print monitor strips with any change in rhythm/arrhythmias.
- Vagal maneuvers: blow through 18ga IV catheter, ice water immersion (facial), carotid massage (unilateral only – listen for bruits prior to performing), or having patient blow against closed glottis (“bear down”).

SYNCOPE

History: <ul style="list-style-type: none"> • Past medical history • Prior episodes/treatments • Medications • GI bleeding • Pregnancy status/missed menses? • Fluid loss/Poor PO intake • Trauma sustained with incident • Prodrome: flushing, lightheaded, tunnel vision, diaphoresis • Associated symptoms: Chest pain, palpitations, seizure activity • Duration • Witness? 	Signs and Symptoms: <ul style="list-style-type: none"> • Loss of consciousness with recovery • Lightheadedness/dizziness • Nausea/vomiting • Palpitations/chest pain • Shortness of breath • Decreased pulse pressure 	Differential Diagnosis: <ul style="list-style-type: none"> • Vasovagal episode • Orthostatic hypotension • Cardiac etiology • Psychiatric • Stroke • Hypoglycemia • Seizure • Shock • Toxicologic / Medication
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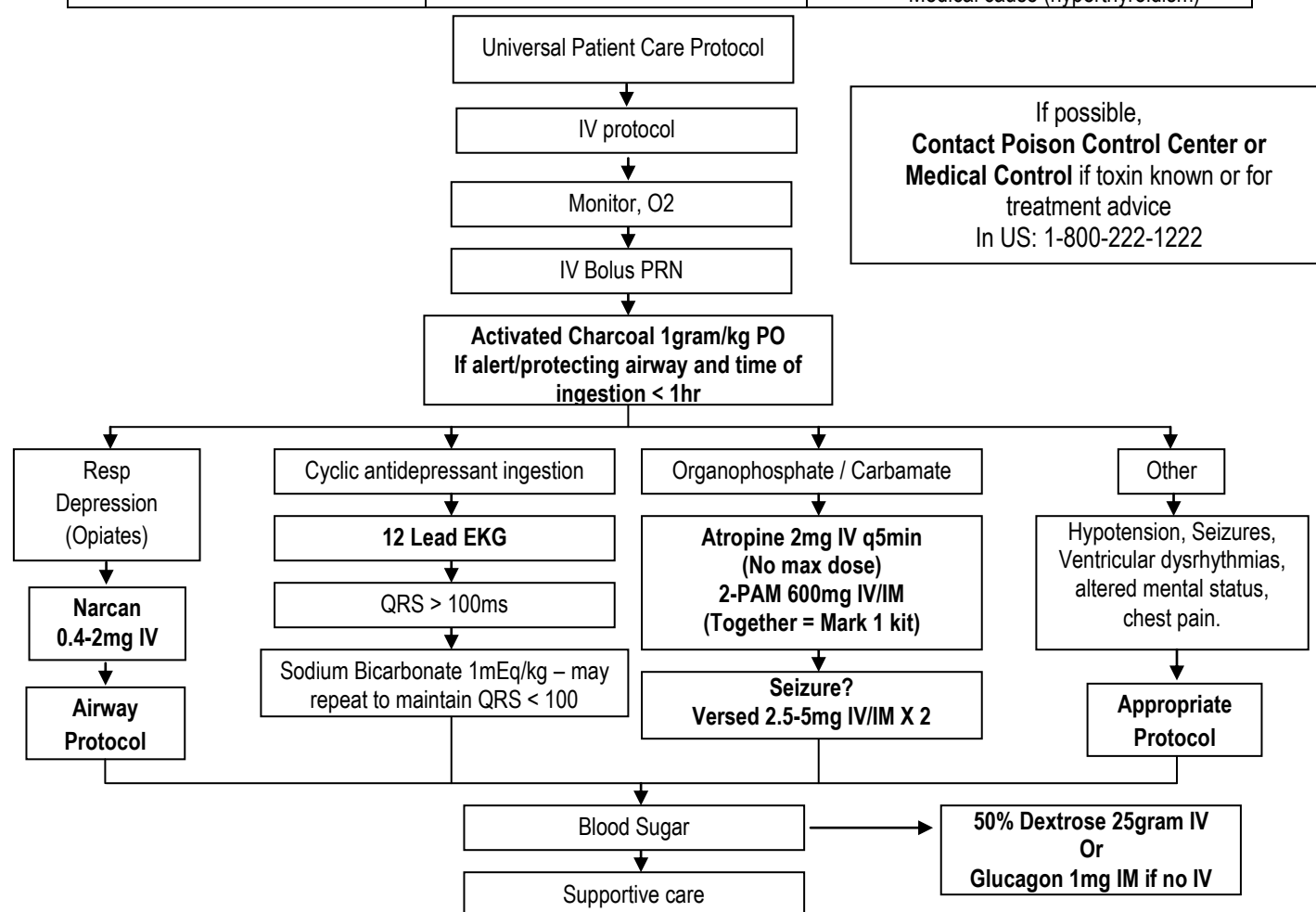


Pearls:

- Assess every patient for signs of trauma if suspected with syncopal event.
- Consider occult bleeding in all cases of syncope: GI bleeding, ruptured ectopic pregnancy, and seizure.
- Prodromal symptoms (i.e. flushing, lightheadedness, diaphoresis, tunnel vision) are often associated with more innocent etiologies, especially if temporally related to standing/rising. Absence of prodrome should raise concern for cardiac/CNS (emergent) etiologies.
- It is uncommon for stroke to cause syncopal episode.
- Patients who sustain trauma to the temporal region of the skull and are now lucid may experience a precipitous loss of consciousness/degeneration due to epidural hematoma.

TOXIC INGESTIONS

History <ul style="list-style-type: none"> • Past medical history • Medications/allergies • Type/Amount of ingestion if known • Route of ingestion/Time • Reason for ingestion 	Signs and Symptoms: <ul style="list-style-type: none"> • Mental status changes • Hypo/Hypertension • Respiratory depression • Tachycardia / Arrhythmias • Seizure 	Differential Diagnosis: <ul style="list-style-type: none"> • Cyclic antidepressants • Tylenol • Depressants • Stimulants • Anticholinergics • Cardiac Medications • Solvents/cleaners • Organophosphates / carbamates • Medical cause (hyperthyroidism)
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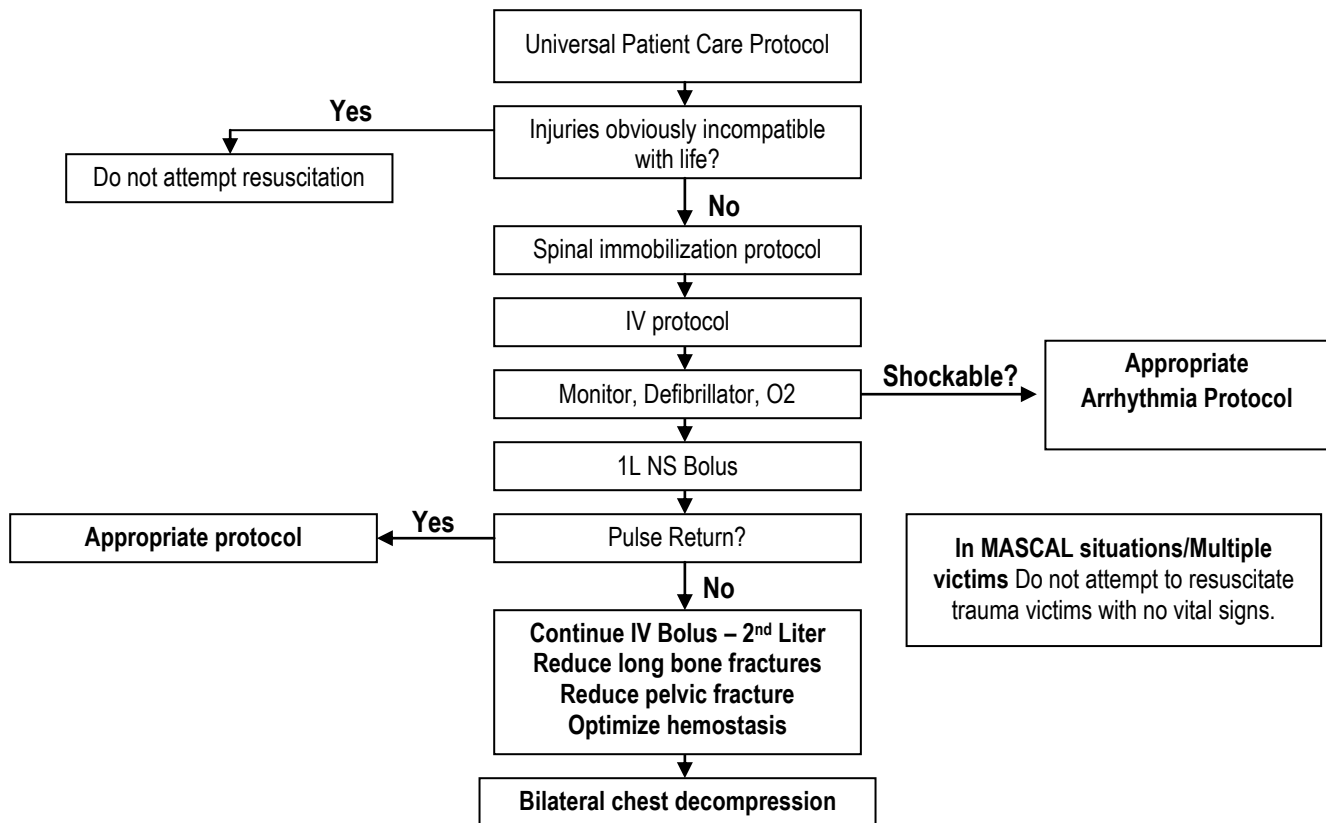


Pearls:

- Do not rely on patient history alone to rule out toxic ingestions.
- Bring bottles, contents, emesis to ED if possible.
- **General supportive care consists of: continuous monitoring, supplemental O2/airway support, IVF resuscitation as required. This is the keystone of management of toxic ingestions.**
- **Opioids:** Depressed mental status, pinpoint pupils, N/V, respiratory depression, hypotension possible.
- **Anticholinergics:** Altered mental status (mad as a hatter), Hyperthermia (hot as a hare), Mydriasis (Blind as a bat), Flushing (Red as a beet).
- **Stimulants:** Altered mental status, tachycardia, diaphoresis, mydriasis, hyperthermia.
- **Cyclic antidepressants:** hypotension, depressed mental status, respiratory depression, cardiac arrhythmias.
- **Organophosphates / Carbamates (cholinergics):** Salivation, Lacrimation, Urination, Diarrhea, Emesis, Altered mental status.

TRAUMA ARREST

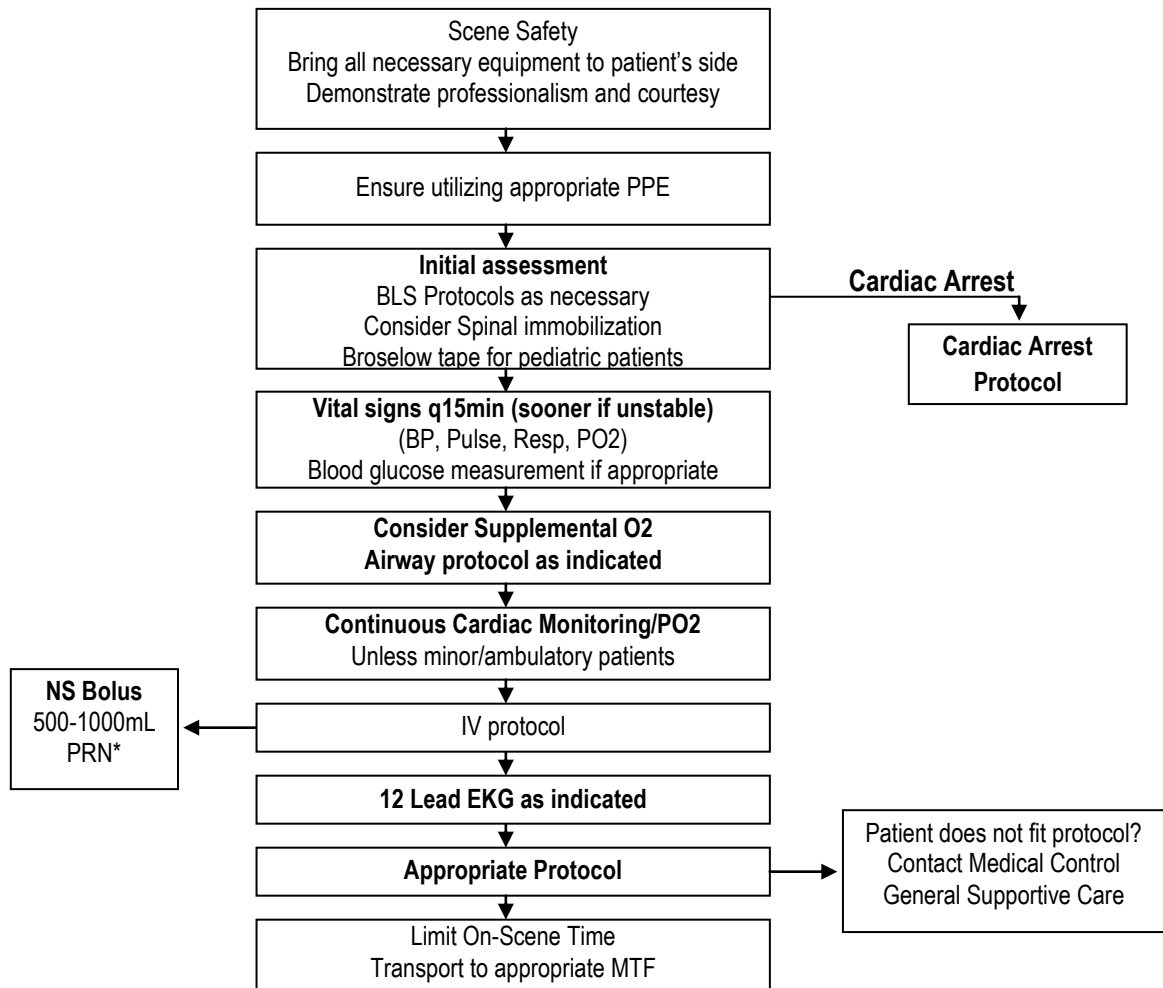
History: <ul style="list-style-type: none"> • Past medical history • Medications • Traumatic injury without pulse • Type of trauma • Time of trauma/duration of downtime 	Signs and Symptoms: <ul style="list-style-type: none"> • Evidence of trauma with no pulse • Lack of response to external stimuli 	Differential Diagnosis: <ul style="list-style-type: none"> • Medical cause of arrest preceding trauma • Tension pneumothorax • Hypovolemic • Cardiac tamponade
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Pearls:

- Injuries obviously incompatible with life include decapitation, massively deforming head/chest injury, and incineration. Also, any evidence of lividity / rigor mortis should result in withholding of resuscitative efforts.
- If unsure whether arrest due to trauma or medical cause – initiate ACLS protocols for any arrhythmias.

UNIVERSAL PATIENT CARE

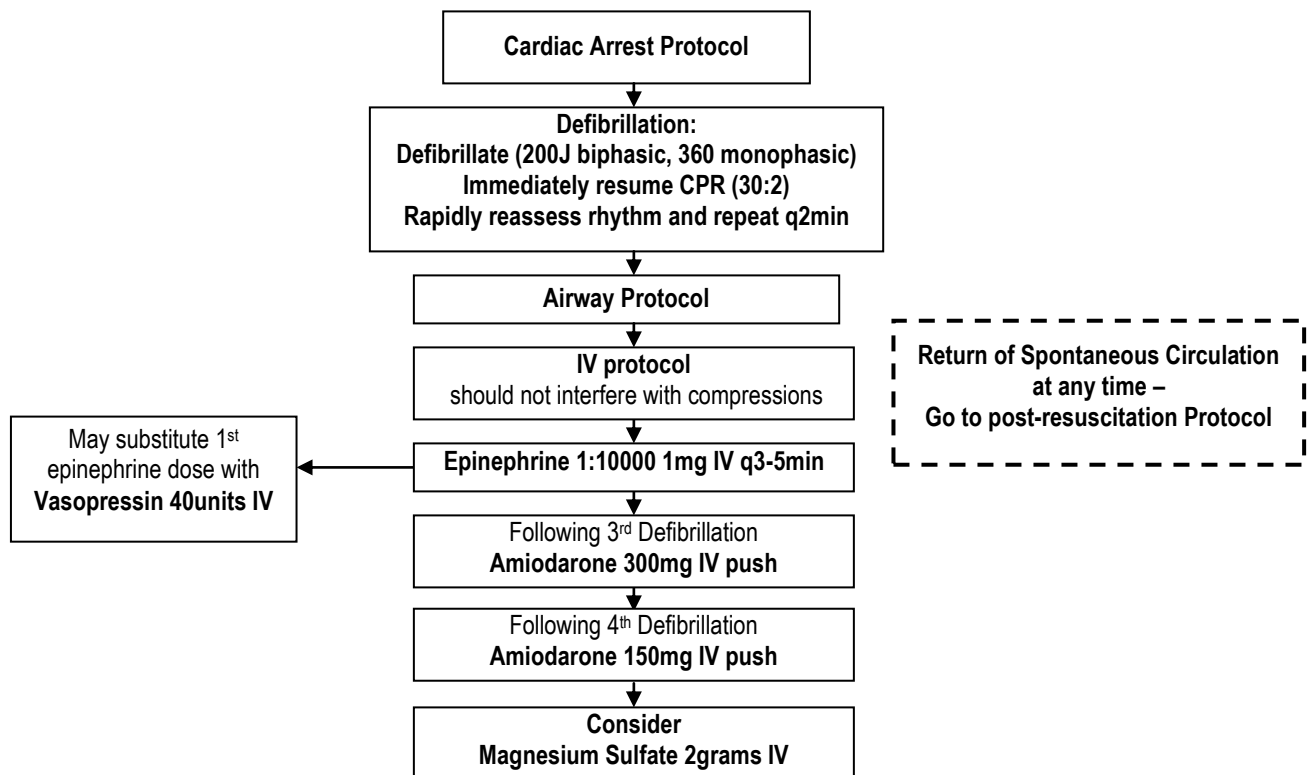


Pearls:

- *Fluid boluses given in trauma victims should be done in accordance with hypotensive resuscitation guidelines – see multiple trauma protocol.
- General supportive measures include: Airway/Respiratory support, continuous hemodynamic monitoring with PO2, Supplemental O2 PRN, IVF boluses, Pain control PRN.
- All patients should have complete vital signs recorded.
- All patient encounters should be recorded on run sheets at end of patient encounter.
- Any mishaps/errors should be brought to attention of medical control ASAP.
- Contact medical control for any necessary assistance when feasible.

VENTRICULAR FIBRILLATION & PULSELESS VENT. TACHYCARDIA

History: <ul style="list-style-type: none"> • Past medical history • Medications/Allergies • Estimated down time • Events preceding arrest • Toxic exposures 	Signs and Symptoms: <ul style="list-style-type: none"> • Unresponsive, apneic, pulseless • Ventricular fibrillation or ventricular tachycardia on EKG 	Differential Diagnosis: <ul style="list-style-type: none"> • Asystole • Artifact/Device failure • Cardiac • Endocrine/Metabolic • Drugs/Toxins • Pulmonary
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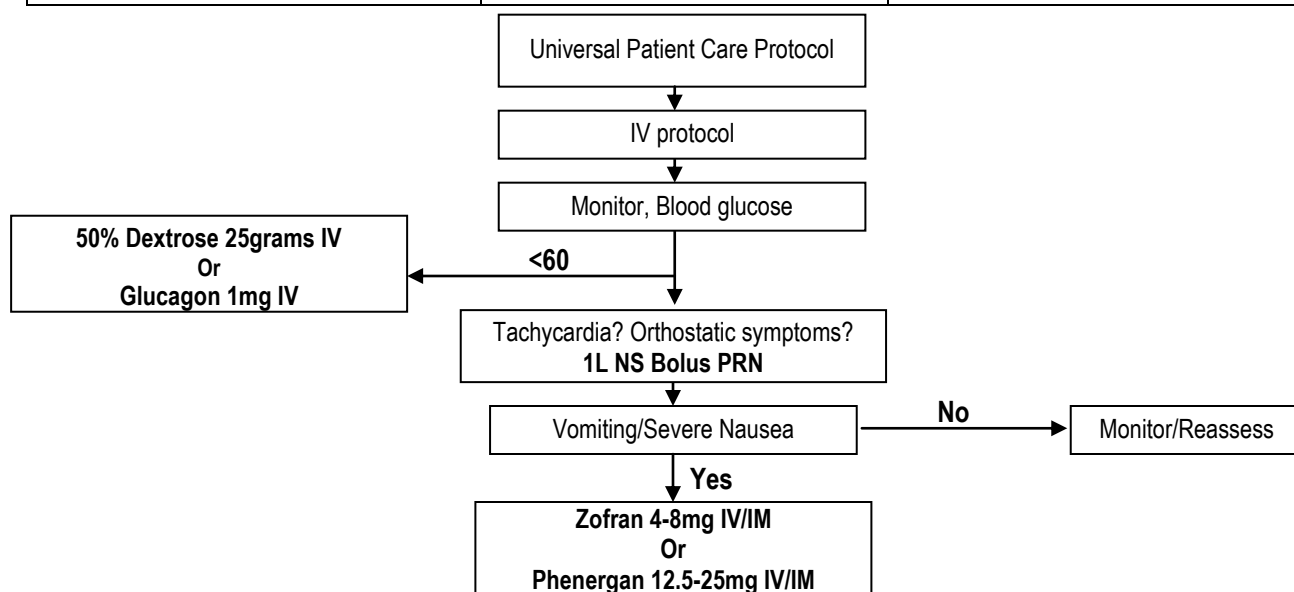


Pearls:

- 2005 ACLS protocol goals: Efficient, uninterrupted compressions; Rapid Defibrillation; Airway control; and IV access – Listed from highest to lowest priority.
- Vasopressin is only given one time, followed by epinephrine q3-5min as needed.
- Calcium and Sodium Bicarbonate used for hyperkalemia.
- Torsades de pointes may benefit from early use of Magnesium
- Consider ceasing efforts if prolonged code (>30min) with no pulses, perfusing rhythm, or patient response. Should attempt to contact medical control prior to ceasing efforts for guidance/approval.

VOMITING & DIARRHEA

History: <ul style="list-style-type: none"> • Past medical/surgical history • Medications/Allergies • Last meal • Last bowel movement/emesis • Improvement/worsening with food/activity • Duration of symptoms • Sick contacts/Travel • Menstrual history/Pregnancy status • Blood in emesis/diarrhea • Head injury/trauma 	Signs and Symptoms: <ul style="list-style-type: none"> • Pain • Abdominal distention • Constipation • Diarrhea • Anorexia • Associated Symptoms: Fever, headache, weakness, malaise, myalgias, cough, dysuria, mental status changes, rash	Differential Diagnosis: <ul style="list-style-type: none"> • CNS injury/mass/infection • Myocardial infarction • Drugs/toxins • Bowel obstruction • Diabetic ketoacidosis • Pregnancy • Infections • Gastroenteritis • Food borne/toxic • Psychologic • Appendicitis
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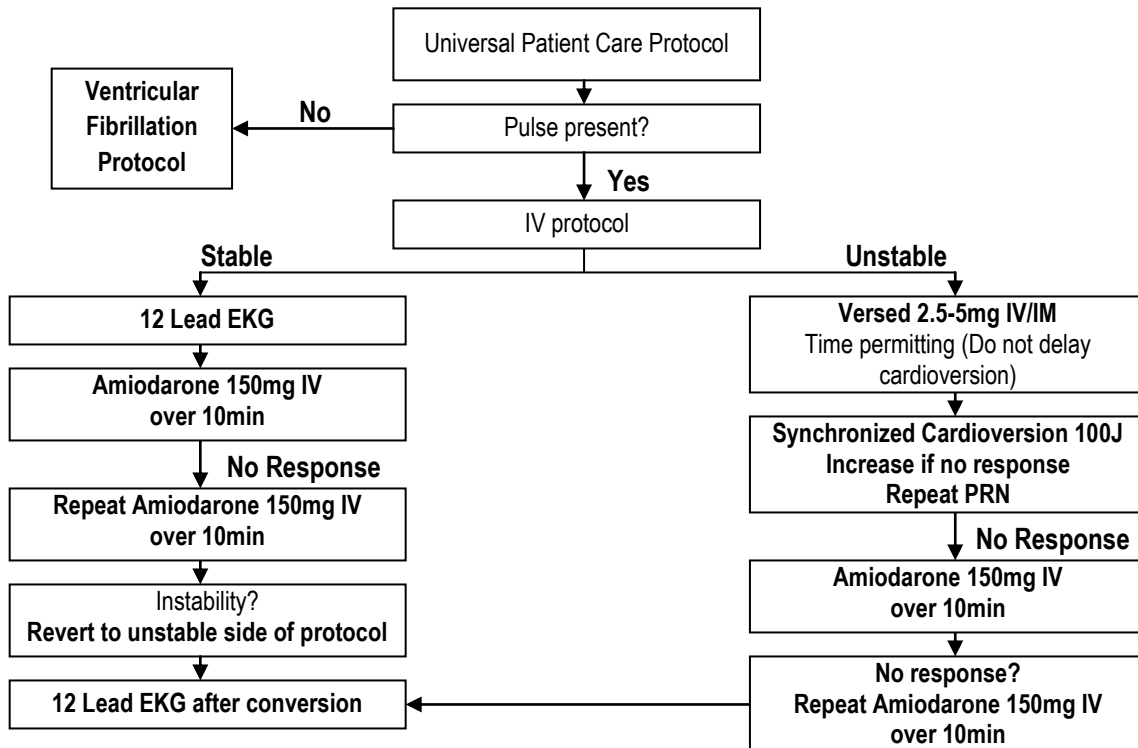


Pearls:

- Suspicion of other underlying condition should prompt immediate referral to appropriate protocol.
- In pregnant patients with nausea/vomiting – can substitute D5 1/2NS or D5NS in place of NS for IVF replacement.
- Continually monitor for any decompensation.

VENTRICULAR TACHYCARDIA/ WIDE COMPLEX WITH PULSE

History: <ul style="list-style-type: none"> • Past medical history • Medications/Allergies • Syncope/near syncope • Chest pain/dizziness • Palpitations 	Signs and Symptoms: <ul style="list-style-type: none"> • Ventricular tachycardia on EKG (regular wide-complex tachy) • Conscious, rapid pulse • Chest pain/Shortness of breath • Dizziness • QRS > .12sec 	Differential Diagnosis: <ul style="list-style-type: none"> • Artifact/Device failure • Cardiac • Endocrine/metabolic • Hyperkalemia • Drugs • Pulmonary
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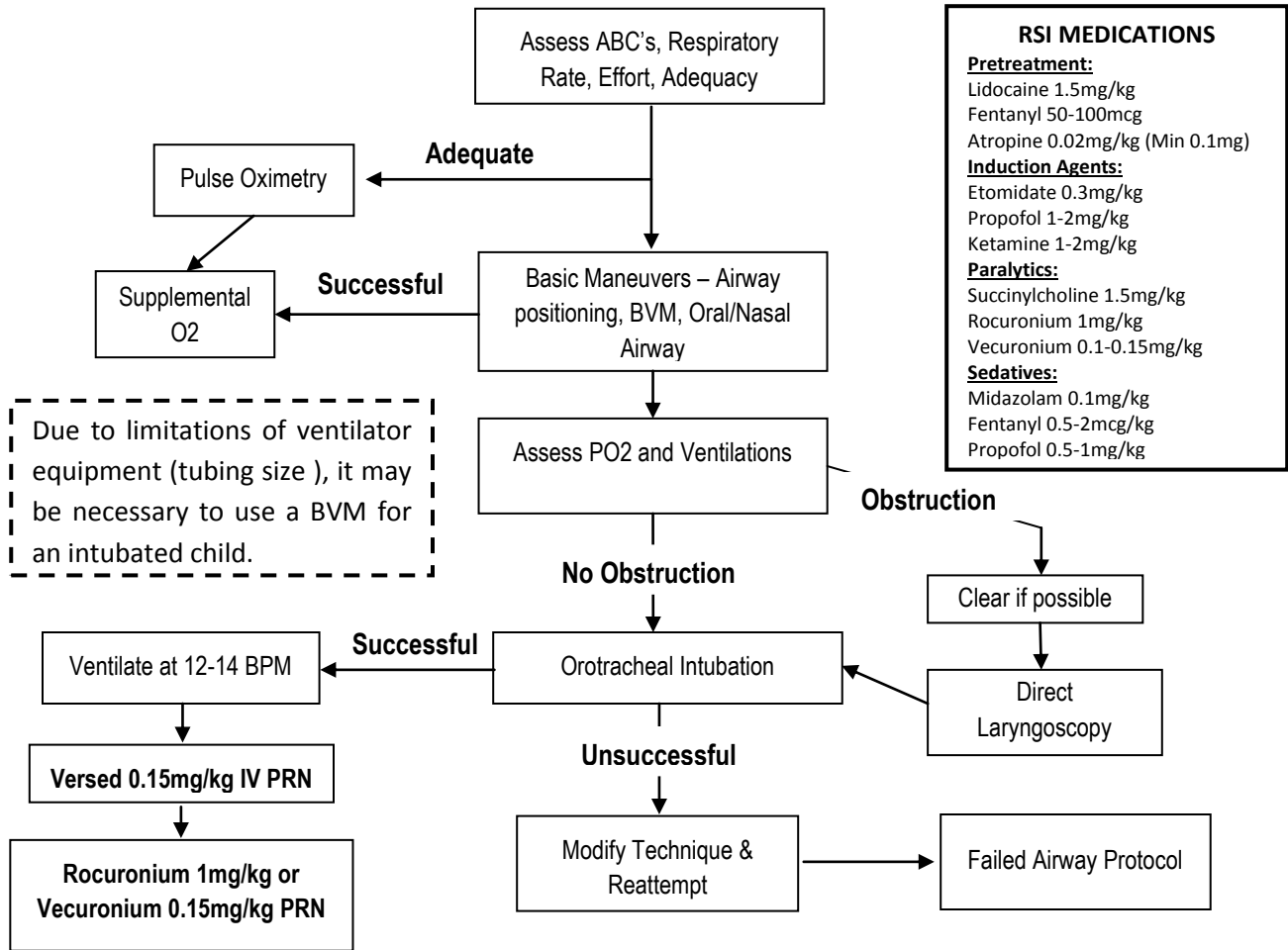
Pearls:

- Do not try to delineate between SVT with aberrancy and Ventricular Tachycardia in unstable patients – treat with immediate cardioversion.
- Symptoms of unstable patient include: Altered mental status, chest pain, hypotension.
- If suspect SVT with aberrancy in stable patient – can attempt adenosine.
- If hyperkalemia suspected (end-stage renal disease, dialysis) – administer 1 ampoule of sodium bicarbonate.

DUSTOFF

PEDIATRIC PROTOCOLS

AIRWAY PEDIATRIC



Pearls:

- Pediatric is defined as anyone < 12yo.
- Capnography is mandatory for all intubations. Record results. Capnometer or END TIDAL CO₂ is an alternate if capnography not available. **For capnography, normal range is 35-45 mm Hg**; adjust ventilator rate as necessary to maintain this range.
- Maintain C-spine immobilization for all patients at risk for spinal injury.
- Administer Oxygen for hyperventilation.
- **BURP** maneuvers or **ELM** can be used to improve laryngoscopic view.
- All intubated patients should receive nasogastric /orogastric tube, time permitting.
- Continuous pulse oximetry should be performed on all patients.
- Secure tube with tape or commercial clamp.
- For patients <2yo, a straight (miller) blade is encouraged.
- **ET Tube size estimated with Broselow or (Age/4)+4.**

BURP = Backward, upward, and rightward displacement of larynx.

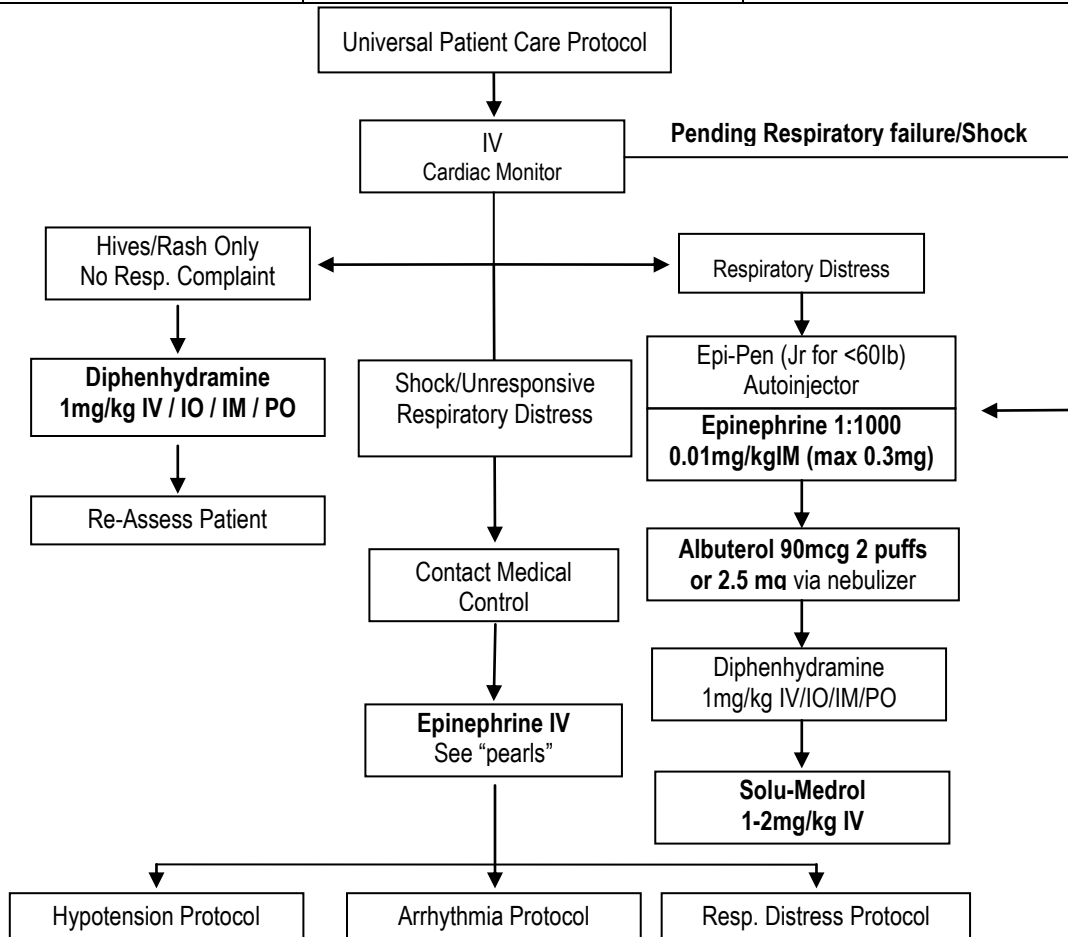
ELM = External Laryngeal Manipulation. Same as "BURP" procedure. However, the pressure is applied by the intubator with right hand. Consistently provides the intubator visualization of the cords.

VENTILATOR SETTINGS:

- Mode: AC or SIMV
- Rate: Varies with age
- Tidal Vol: 6-10mL/Kg,
- I:E = 1:2-4
- PEEP: 5
- FiO₂: 100% - adjust as necessary. Try to decrease FiO₂ as much as possible while keeping O₂ sats @ 98-100%
- **Goal FiO₂ = 50-60% to conserve battery life and O₂, while maintaining patient SpO₂ > 95%.**

ALLERGIC REACTION PEDIATRIC

History: <ul style="list-style-type: none"> Onset and location Bite or sting History of anaphylaxis Food allergy/exposure Medication allergy/exposure New clothing/soap/detergent Past medical history Medications 	Signs and Symptoms: <ul style="list-style-type: none"> Itching or hives Cough/wheeze/resp. distress Chest/Throat tightness Difficulty swallowing Hypotension or shock Edema Nausea/Vomiting 	Differential Diagnosis: <ul style="list-style-type: none"> Urticaria (rash only) Anaphylaxis (2 or more systems) Shock (other than anaphylactic) Angioedema Aspiration/Airway obstruction Asthma or COPD Pulmonary edema/CHF
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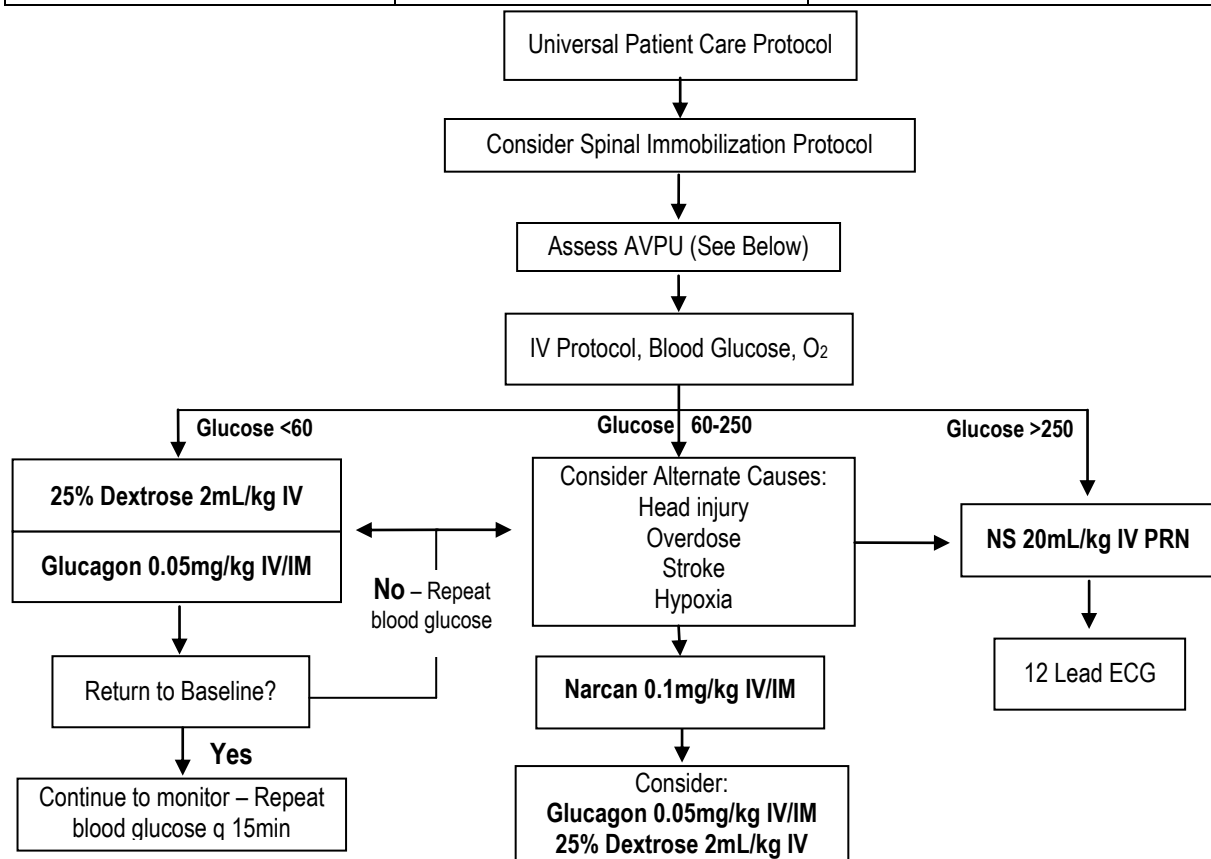


Pearls:

- To mix epinephrine for IV:
 - 0.1mL of 1:1000 epinephrine in 10mL NS – push over 10-15min (100mcg).
 - 1mL 1:1000 epinephrine in 500mL D5W - @ 0.5-2mL/min = 1-4mcg/min.
 - 1mg 1:10,000 epinephrine (cardiac vial) in 250mL D5W (4mcg/mL) – run @ 1-4mcg/min (15-60mL/hr).
- The shorter the interval from contact to symptoms, the more severe the reaction.

PEDS ALTERED MENTAL STATUS

History:	Signs and Symptoms:	Differential Diagnosis:
<ul style="list-style-type: none"> Known diabetic, medic alert tag Any known drug use Possibility of toxic ingestion Past medical history Medications Trauma Change from previous condition 	<ul style="list-style-type: none"> Decreased mental status/coma Bizarre behavior Somnolence Diaphoresis/Dry, red skin Polyuria / polydipsia Fruity breath Altered respirations Signs of trauma 	<ul style="list-style-type: none"> Head trauma Stroke CNS tumor/mass/bleed/infection Thyroid dysfunction Hyperglycemia/hypoglycemia Diabetic ketoacidosis Toxic ingestion Environment (hyperthermia/hypothermia) Hypoxia Psychiatric disorders

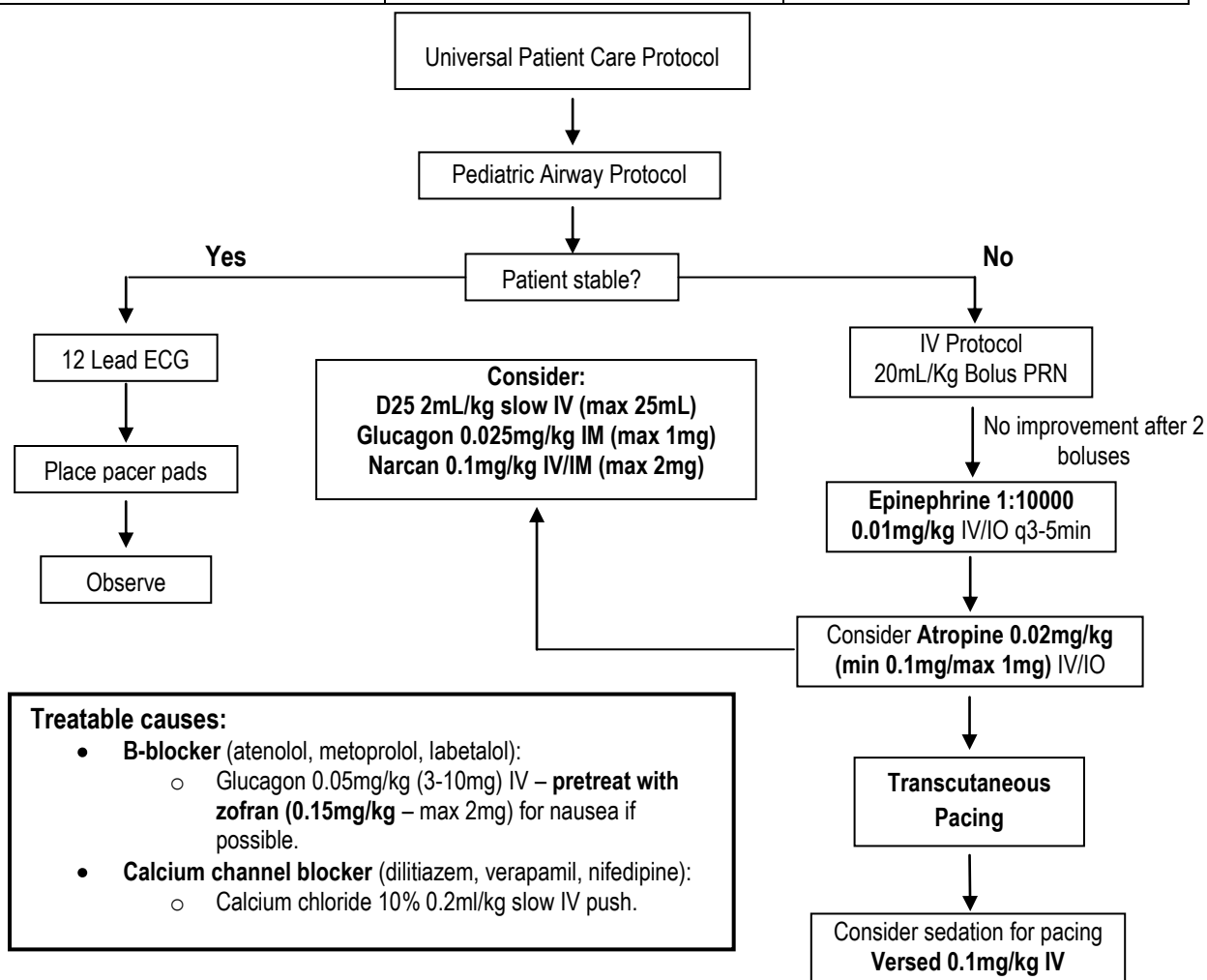


Pearls:

- Be aware of AMS as a presentation of environmental exposure/toxins/hazmat – use personal protection accordingly / decon.
- Recheck blood glucose after any intervention.
- Oral glucose okay if patient alert / protecting airway, and solution available. Proteins + complex carbs (i.e. sandwich, granola) are better, longer lasting glucose source than simple sugars.
- EKG should be obtained in all suspected toxin or diabetic ketoacidosis cases – evaluate for tall, peaked T-waves (hyperkalemia) or QRS widening >100ms (toxins).
- Restrain patient as necessary for their and crewmembers safety during flight.
- Glucagon may cause nausea / vomiting – Consider pre-treating with Zofran 0.15mg/kg (max 2mg) IV/IM.**
- May consider glucagon/dextrose in patients with low-end normal glucose levels if failing to improve with other methods.
- In pediatric patients, AVPU (**A**lert, **R**esponsive to **V**erbal stimuli, **R**esponsive to **P**ainful stimuli, or **U**nresponsive) evaluation is a simple and effective way to assess/document level of consciousness.

PEDIATRIC BRADYCARDIA

History: <ul style="list-style-type: none"> Past medical history Medications/Allergies Toxic ingestions Congenital diseases Foreign body aspiration 	Signs and Symptoms: <ul style="list-style-type: none"> Decreased heart rate Delayed capillary refill Mottled skin/cyanosis Hypotension Altered level of consciousness Stridor 	Differential Diagnosis: <ul style="list-style-type: none"> Toxic ingestion Respiratory distress/failure Hypovolemia Hypothermia Trauma Hypoglycemia
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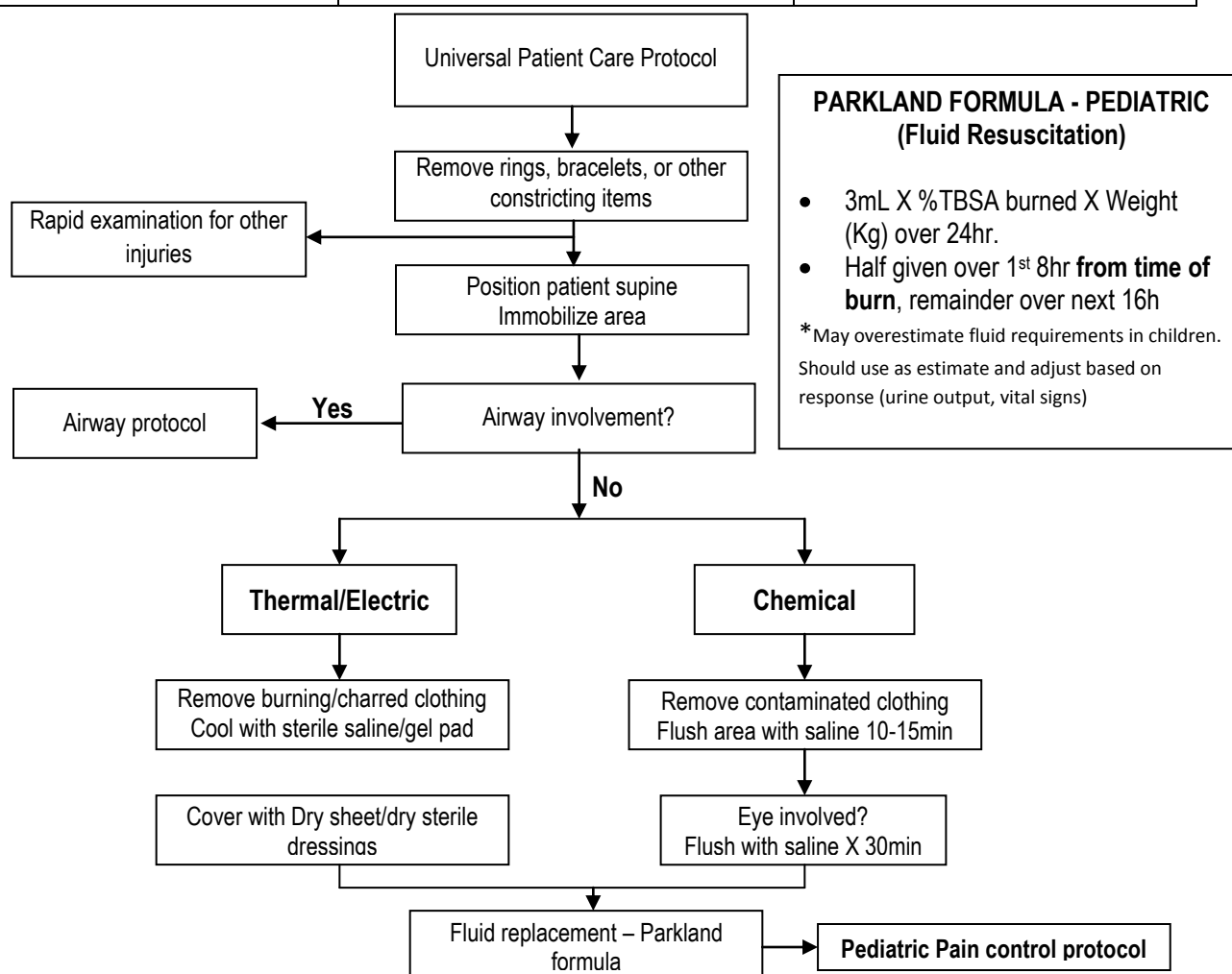


Pearls:

- Decompensation at any time (altered MS, hypotension, etc.) should prompt treatment as unstable patient.
- All bradycardic patients should have pacer pads in place after initial evaluation.
- Evaluate for treatable causes of bradycardia (B-blockade, Ca Channel blockade).
- The majority of pediatric cardiac problems are actually airway problems.
- In young, breast fed patients – evaluate for mother's medications as they can cause toxicity in the infant.
- Pediatric pacer pads should be used if available. If only adult pads are obtainable – they should be placed in the anterior-posterior position.

PEDIATRIC BURNS

History: <ul style="list-style-type: none"> Type of burn (thermal chemical, electrical) Inhalation injury Time of injury Other trauma/secondary injury Loss of consciousness Immunization history Past medical history Medications 	Signs and Symptoms: <ul style="list-style-type: none"> Burns, pain, swelling Dizziness Loss of consciousness Airway involvement (singled nasal hair, carbonaceous sputum, etc) Hoarseness/wheezing Loss of consciousness 	Differential Diagnosis: <ul style="list-style-type: none"> Superficial burns (1st degree) Partial thickness (2nd degree) Full thickness (3rd degree) Chemical burns Thermal burns Electrical burns Radiation Secondary trauma
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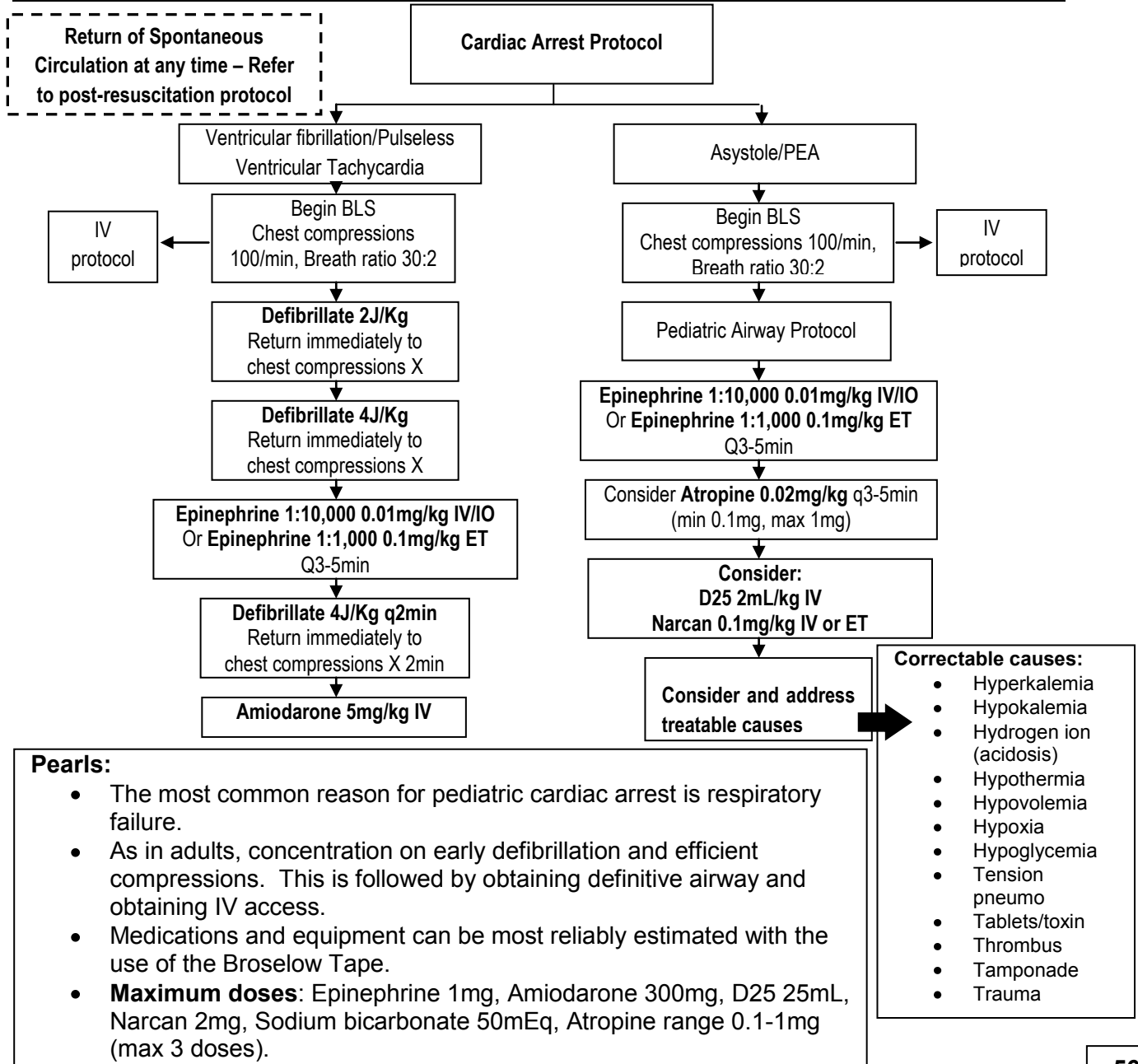


Pearls:

- Burns with airway involvement require immediate airway protection with RSI/surgical airway.
- Parkland formula may underestimate fluid requirement for electrical burns – **maintain urine output 1mL/kg/hr.**
- Burn patients are prone to hypothermia – must protect from environment. Also, never use ice to cool large burn areas.
- Do not overlook the possibility of multi-system trauma in burn patients.
- All burns require 100% O₂ via NRB unless intubated.
- Never use nitrites for suspected cyanide toxicity in enclosed space fires – can worsen hypoxia. Creates methemoglobinemia.

PEDIATRIC PULSELESS ARREST

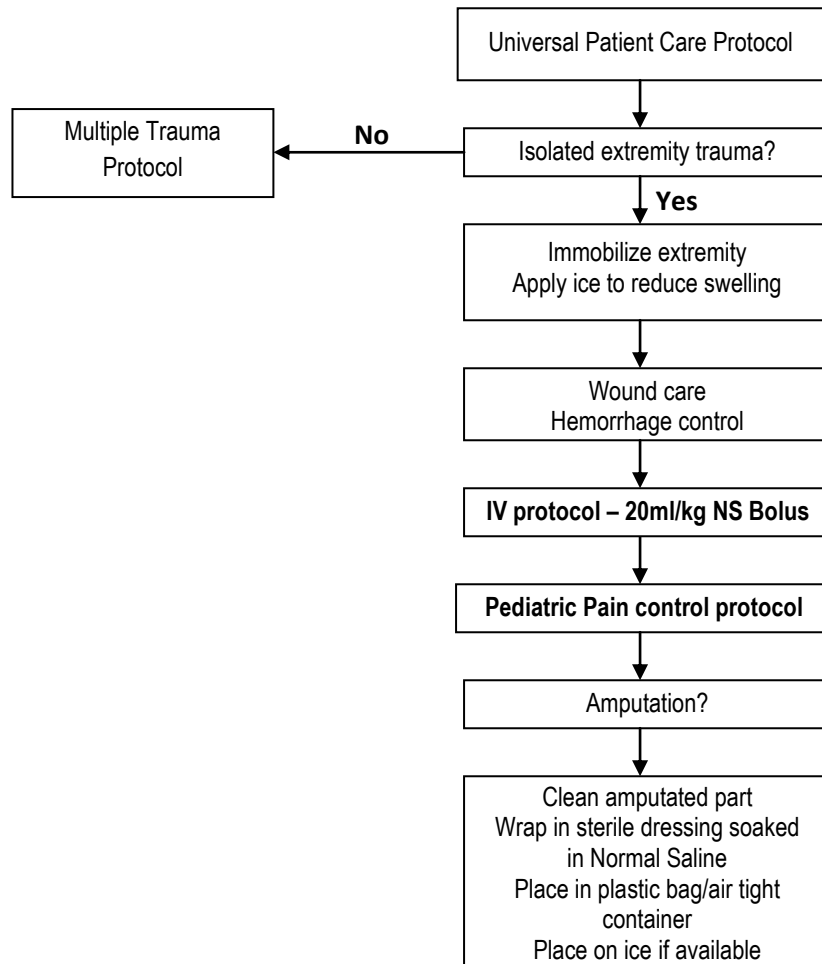
History: <ul style="list-style-type: none"> Past medical history Medications/Allergies Time/Duration of arrest Foreign body aspiration Hypothermia Suspected abuse 	Signs and Symptoms: <ul style="list-style-type: none"> Unresponsive Pulseless Cardiac arrest 	Differential Diagnosis: <ul style="list-style-type: none"> Respiratory failure (most common) Hypovolemia Trauma/Abuse Congenital heart disease Toxin/Medication Hypothermia Hypoglycemia Electrolyte abnormality SIDS
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EXTREMITY TRAUMA

PEDIATRIC

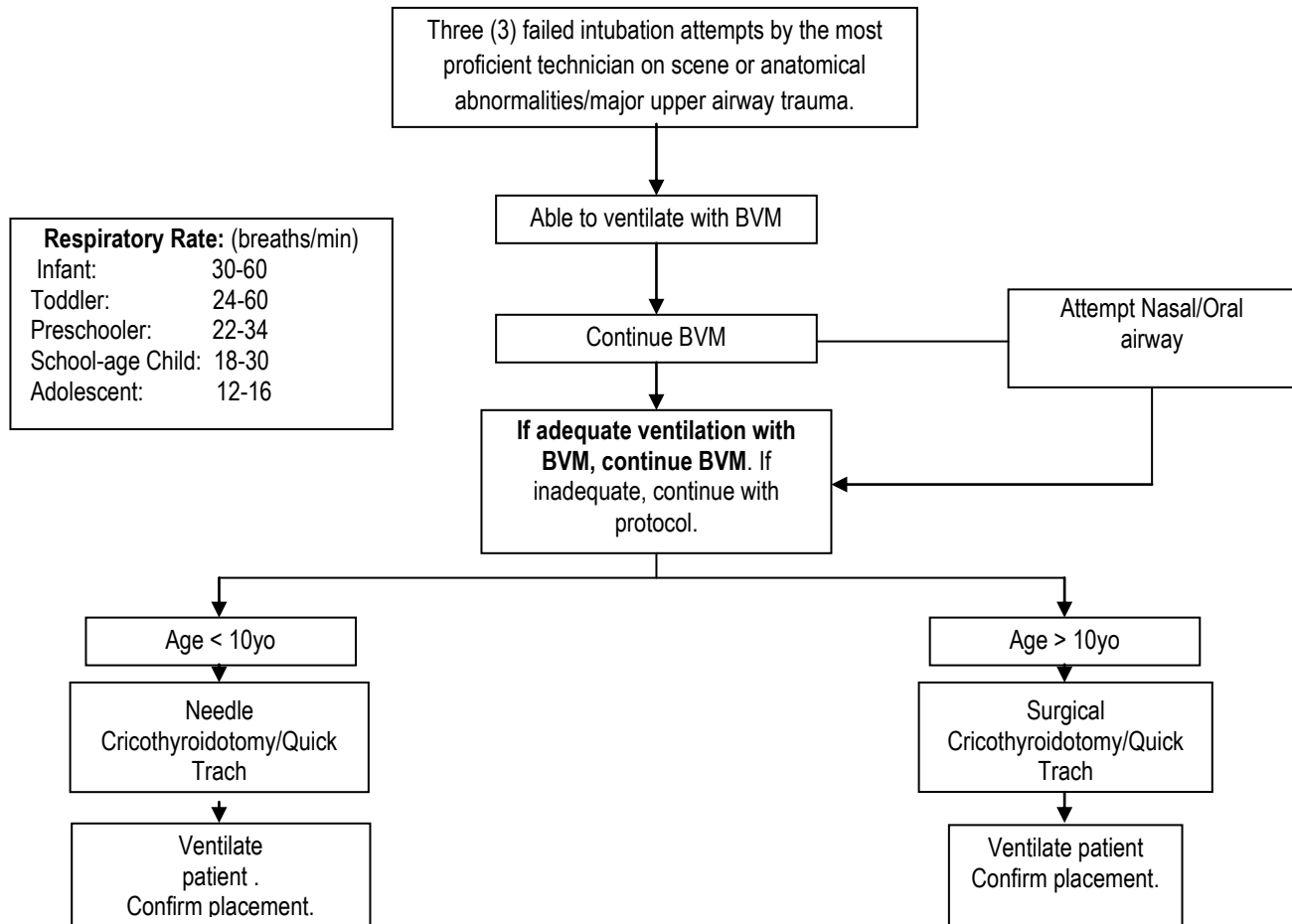
History: <ul style="list-style-type: none"> • Type of injury • Mechanism – crush, penetrating, blast, amputation • Time of injury • Open vs. closed wound • Contamination • Medical history • Medications 	Signs and Symptoms: <ul style="list-style-type: none"> • Pain/swelling • Deformity • Altered sensation/function • Diminished pulse/cap refill • Decreased temperature • Bleeding 	Differential Diagnosis: <ul style="list-style-type: none"> • Abrasion • Contusion • Multi-trauma • Fracture • Dislocation • Laceration • Sprain/strain • Amputation
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Pearls:

- In amputations – time is critical.
- Evaluate and document neurovascular status in all fractures/dislocations.
- Never attempt to reduce an open fracture.
- Blood loss can be severe and concealed in long bone fractures – especially the femur.
- Tourniquets should be used without hesitation to control major bleeding.

FAILED AIRWAY PEDIATRIC



Pearls:

- Continuous pulse oximetry should be utilized in all patients with an inadequate respiratory function.
- Continuous EtCO₂ monitoring should be attached when available to monitor adequacy of ventilation.
- Notify medical control as soon as possible of failed airway.
- Needle Cricothyroidotomy can be performed by all RL1 medics once approved by medical director. This should be utilized quickly with severe airway trauma or inability to intubate.
 - Puncture cric. Membrane with 14ga IV attached to 3mL syringe at 90deg angle. Once air aspirated, change angle to 45deg and advance **CATHETER ONLY**. Remove needle/syringe and secure catheter in place. Remove plunger from syringe and attach adapter from 7-0ETT. Reattach this to catheter and attach BVM w/100% O₂.
 - **QUICKTRACH**: see procedures for instruction 2.0mm

PEDIATRIC HEAD INJURY

History: <ul style="list-style-type: none"> Time of injury Mechanism: blunt/penetrating Loss of consciousness Bleeding Past medical history Medications 	Signs and Symptoms: <ul style="list-style-type: none"> Pain, swelling, bleeding Ecchymosis Deformity Altered mental status Respiratory distress/failure Vomiting 	Differential Diagnosis: <ul style="list-style-type: none"> Skull fracture Brain injury Epidural hematoma Subdural hematoma Subarachnoid hemorrhage Spinal injury Abuse
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Sedation:

Propofol 10-50 mcg/kg/min IV
Fentanyl 1 mcg/kg/hr IV
Etomidate: 0.3 mg/kg: **RSI only**
Versed 1-2 mg/hr IV
***Ketamine**: 1-2 mg/kg

Paralytic:

Vecuronium 0.1 mg/kg
Rocuronium 1mg/kg

Refer to Pediatric Airway Protocol

* **KETAMINE**: dissociative Anesthetic, Analgesic and Sedative: **USE ONLY** for ICP patients that have severe hypotension. Preserves respiratory drive, increases HR, contractility, MAP, cerebral blood flow, and bronchodilation. Contraindicated in pt's with ICP and hypertension and/or spontaneous cerebral hemorrhage.

Monitor and reassess q10min

Universal Patient Care Protocol

Isolated head trauma?

No

Multiple trauma protocol

Yes

Spinal immobilization protocol

IV protocol

20ml/kg NS bolus PRN – keep SBP >100

For Flight. **3% Hypertonic NS**
 (5cc/kg) IV bolus x 15 mins.
 Infusion: (0.5cc/kg/hr)

Assess GCS/Responsiveness

GCS < 8

Gag reflex present

Yes

Assist with jaw thrust,
 nasopharyngeal airway,
 supplemental O2

GCS > 8

Maintain PO2 > 92%

Evidence of elevated ICP

Seizure – refer to pediatric seizure protocol

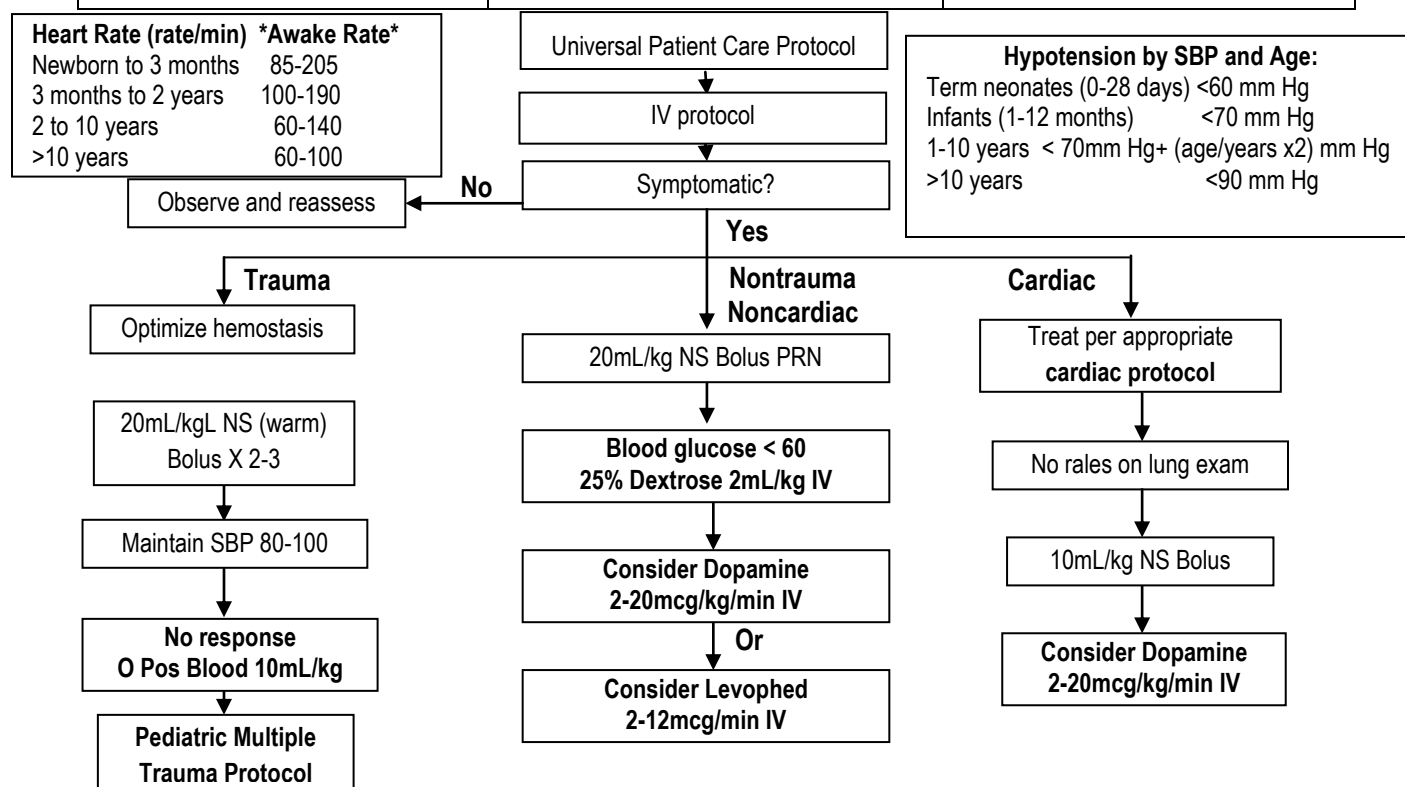
- **Mannitol** 1gram/kg IV bolus
 - **Elevate** head to 30deg if possible
 - **3% Hypertonic Saline** 5cc kg IV Bolus over 15 mins. Infusion: (0.5cc/kg/hr)

Pearls:

- Key to treatment of head injured patients is to prevent hypoxic insult. Maintain PO2 and CPP by preventing hypotension. For Flight: **SBP > 90mm Hg, SpO₂ > 93%, MAP > 90 mm Hg**
- Evidence of increased ICP** – *dilated, sluggish pupil(s), motor abnormalities, persistent/repetitive vomiting*. For clear signs of herniation, titrate **CO₂** to 32-35 mm Hg on capnography.
- Cushing's reflex** can be seen in a minority of patients (mostly peds) – *hypertension, respiratory abnormalities, and bradycardia*.
- Reassess GCS and mental status often to prevent missing subtle changes.
- Mannitol should be given as boluses – not a constant infusion. Do not use in hypotensive, dehydration or under-resuscitated pt's.
- Young patients may develop hypovolemia from intracranial bleeding as their unfused skull can enlarge to accommodate more fluid

HYPOTENSION/ SHOCK

History: <ul style="list-style-type: none"> Past medical history Medications Blood loss Fluid loss Infections Cardiac disease Allergic reaction 	Signs and Symptoms: <ul style="list-style-type: none"> Restlessness/confusion Weakness/dizziness Tachycardia Pale, cool, clammy skin Delayed capillary refill Hypotension Nausea/vomiting Decreased responsiveness/lethargy 	Differential Diagnosis: <ul style="list-style-type: none"> Shock: Hypovolemic, cardiogenic, septic, neurogenic, anaphylactic Cardiac arrhythmia Pulmonary embolus Tension pneumothorax Medication effect/OD Vasovagal episode Dehydration Congenital heart disease
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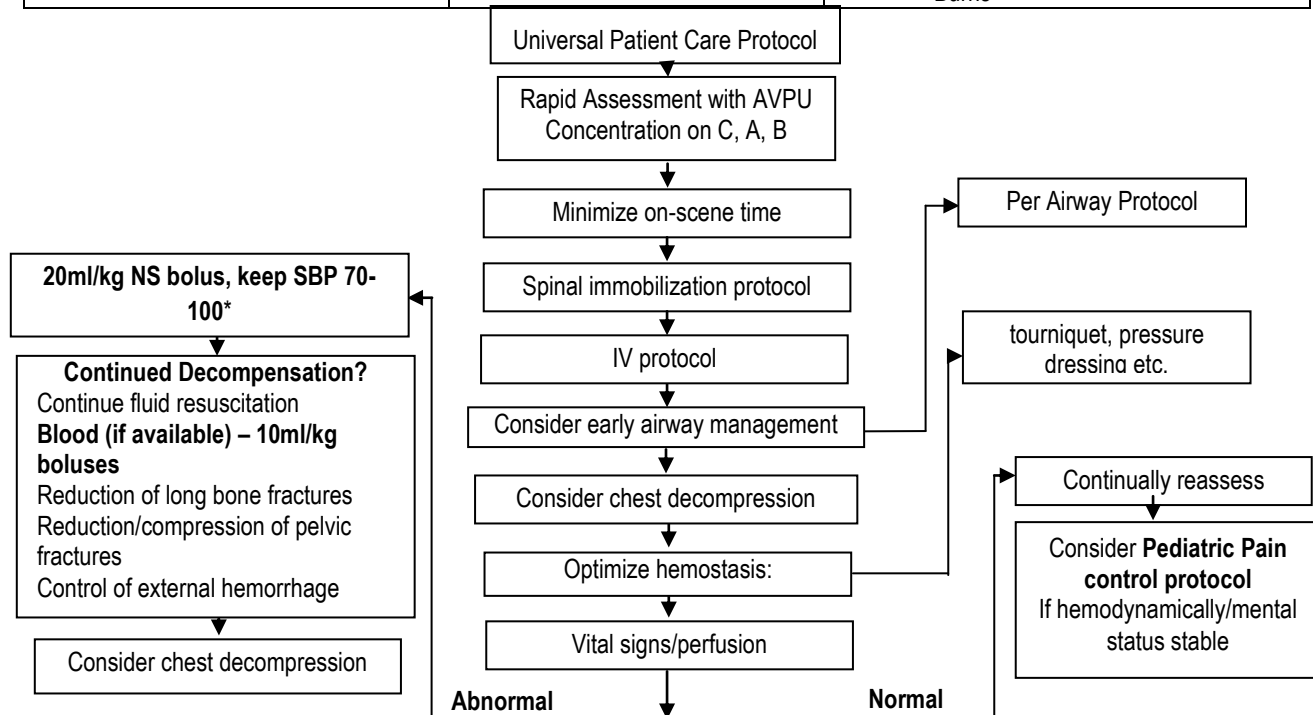


Pearls:

- Hypotension in pediatric patients is defined as a SBP less than 70mmHg + [Age(yr) X 2].**
- Should treat patient prior to onset of shock if possible. Early signs of impending shock include tachycardia, orthostatic signs, and narrowing pulse pressure (systolic-diastolic bp).
- Consider all causes of shock and treat per appropriate protocol.
- Pressors have little to no role in trauma – optimize hemostasis and correct volume loss.
- Decreasing heart rate may be a sign of impending collapse in pediatric patients.
- If no pulse or altered mental status, give IV fluids (small boluses) until appropriate BP is gained per pediatric patient's age.

PEDIATRIC MULTIPLE TRAUMA

History: <ul style="list-style-type: none"> • Time of injury • Damage to vehicle/compartments • Patient location in vehicle • Others injured or dead • Restraint/protective equipment • Past medical history • Medications 	Signs and Symptoms: <ul style="list-style-type: none"> • Pain, swelling, bleeding • Ecchymosis • Deformity • Altered mental status • Respiratory distress/failure • Vomiting • Hypotension/shock • Cardiac arrest 	Possible Injuries: <ul style="list-style-type: none"> • Tension pneumothorax • Flail chest • Pericardial tamponade • Open chest wound • Hemothorax • Intra-abdominal injury/bleeding • Pelvis/long-bone fracture • Spine/Spinal cord injury • Head injury • Extremity fracture/dislocation • HEENT injuries • Hypothermia • Burns
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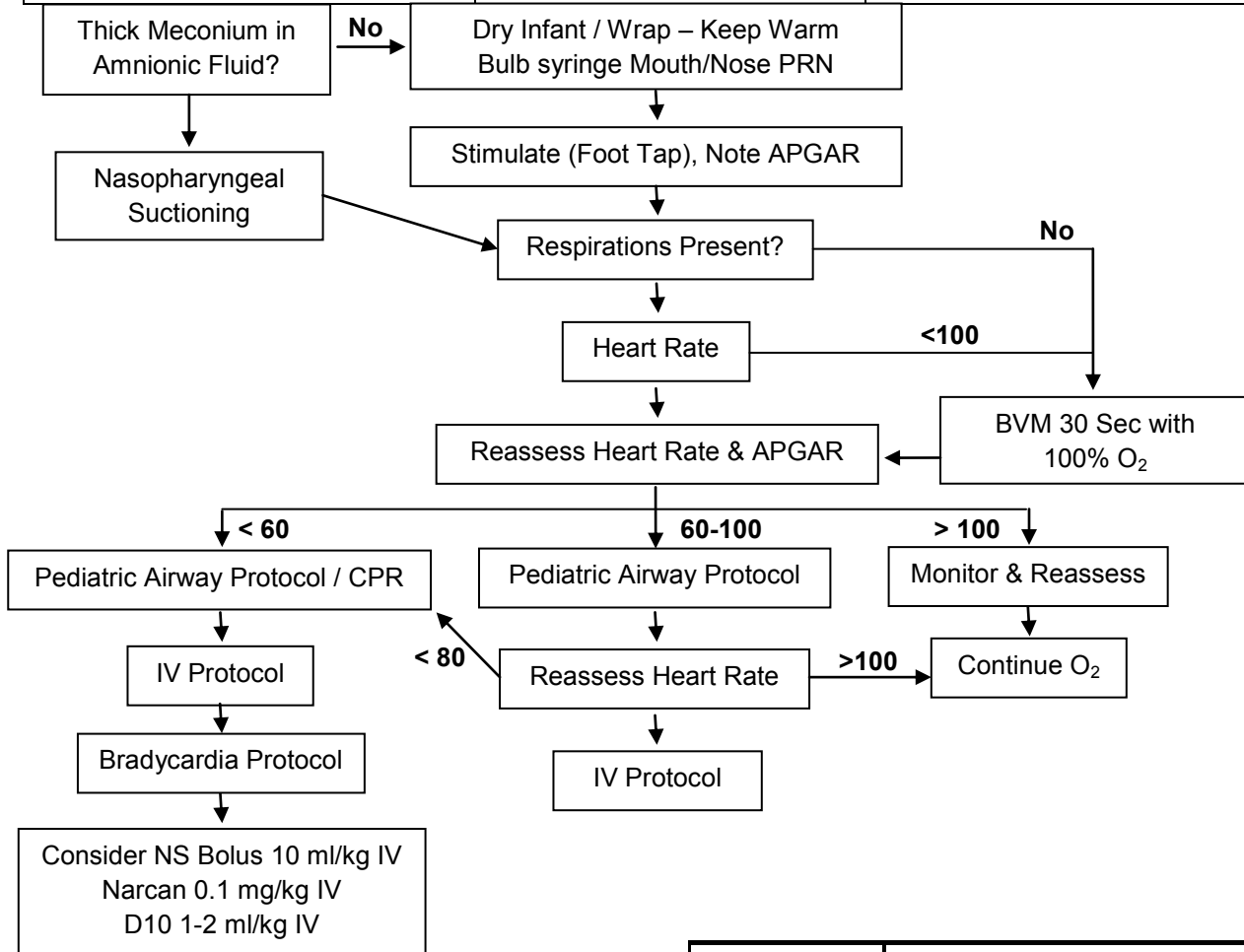


Pearls:

- Severe extremity bleeding should be immediately addressed with a tourniquet.
- Fluid resuscitation encouraged to stabilize patient. However, goal is not to return BP to “normal” level as this may be detrimental. Instead, goal is to control BP in hypotensive range until definitive hemostasis can be obtained.
- **If available, O pos (male) or O neg (female) blood products should be given if NS bolus fails to improve hemodynamics.**
- Narrowed pulse pressure should prompt resuscitation – do not wait for decompensation to ensue.
- Stabilize pelvic fractures with sheet/binder and tie feet together to prevent excess blood loss into the pelvis.
- BP should be maintained in the hypotensive range in cases of multiple trauma. **The normal BP for small children can be estimated $(70 + [\text{Age} \times 2])$** and fluids should be used to stabilize/maintain the BP near this level. As in adults, do not over-aggressively attempt to raise the BP to “normal” levels.

NEWLY BORN DISTRESS

History: <ul style="list-style-type: none"> • Due Date / Gestational Age • Multiple Gestations • Meconium • Delivery Difficulties • Known Congenital Disease • Maternal History / Medications 	Signs and Symptoms: <ul style="list-style-type: none"> • Respiratory Distress • Peripheral Cyanosis / Mottling • Central Cyanosis • Altered Responsiveness • Bradycardia • Weak Cry 	Possible Injuries: <ul style="list-style-type: none"> • Airway Problem / Blockage • Infection • Maternal Medication Effects • Hypovolemia • Hypoglycemia • Congenital Heart Disease
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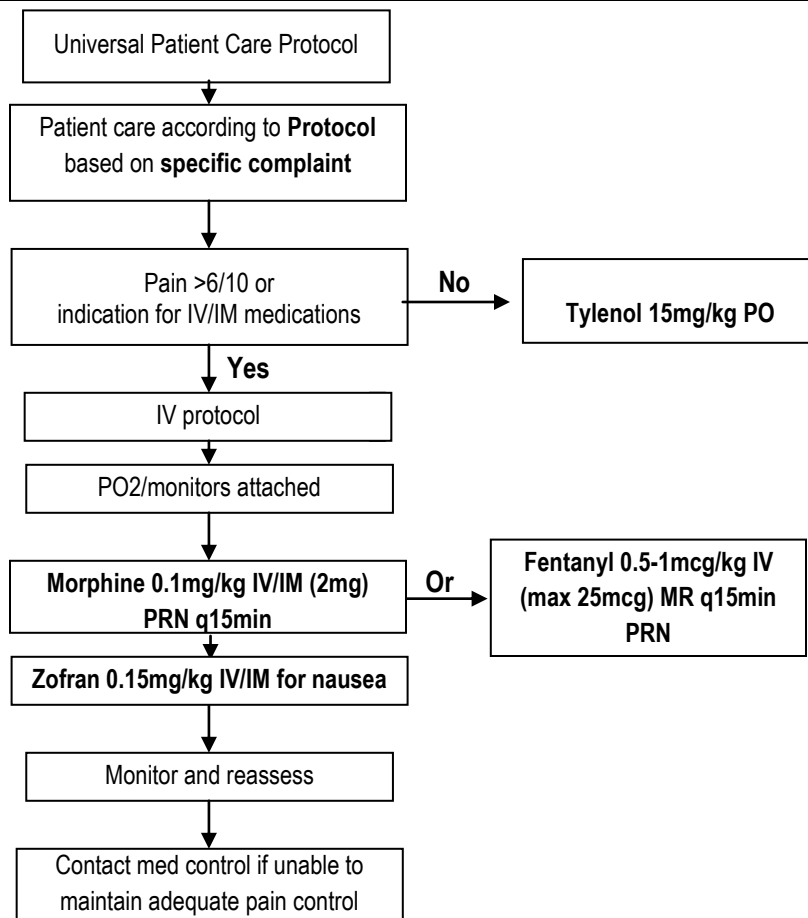
Pearls:

- Maternal Sedation / narcotics will sedate infant. Ensure airway control prior to administration of Narcan, as this may precipitate seizures.
- Consider hypoglycemia as etiology of respiratory depression in children, especially with diabetic mothers.
- Document 1 and 5 min APGAR Scores.
- Can use D12.5 1.0-2.0 ml/kg in infants. Dilute D50 to ¼ strength. (1 ml D50 in 3 ml NS).

SIGN	APGAR SCORE		
	0	1	2
Heart Rate	Absent	< 100	> 100
Respiratory Effort	Absent	Slow-Irregular	Good Cry
Muscle Tone	Flaccid	Some Extremity Flexion	Active Motion
Reflex Irritability	No response	Grimace	Vigorous Cry
Color	Pale	Cyanotic	Completely Pink

PAIN CONTROL

History: <ul style="list-style-type: none"> • Age • Location of pain • Duration • Severity • Past medical history • Medications • Allergies 	Signs and Symptoms: <ul style="list-style-type: none"> • Severity • Quality • Radiation • Relation to activity • Increased with palpation 	Differential Diagnosis: <ul style="list-style-type: none"> • Musculoskeletal • Visceral • Cardiac • Pleural/respiratory • Neurogenic • Renal
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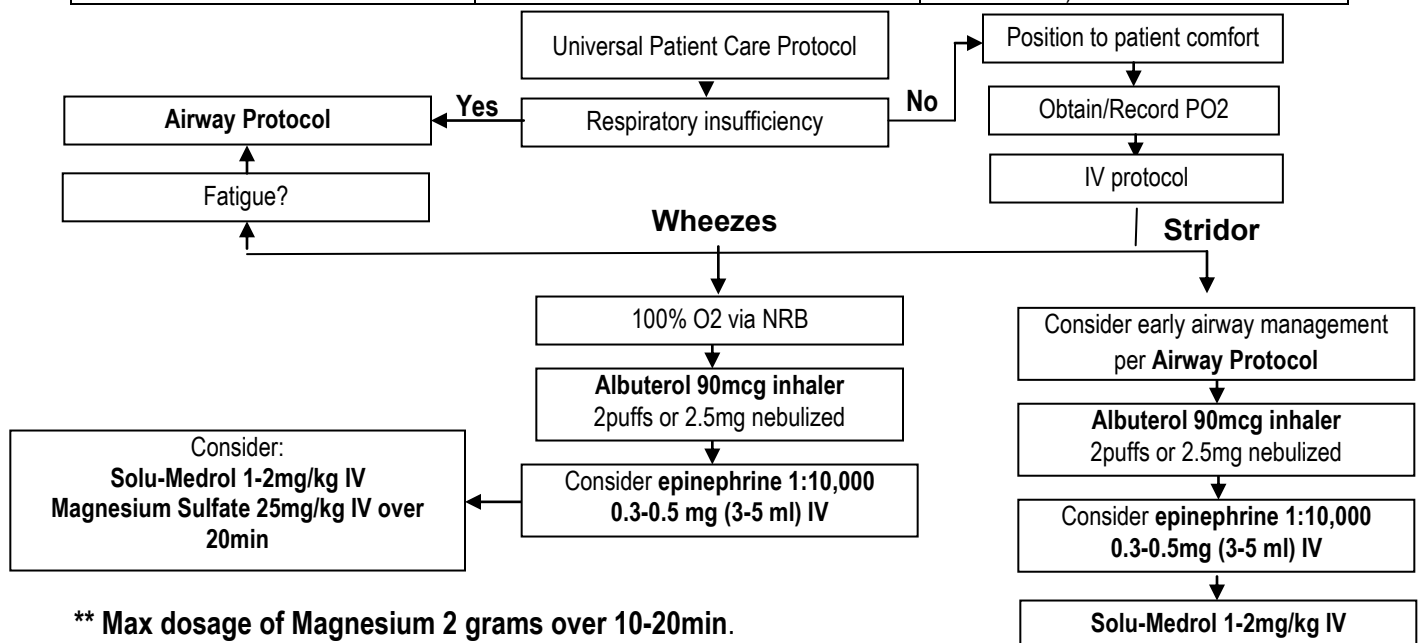


Pearls:

- Document patient's medications and all allergies prior to administration of medications.
- PO medications should not be used in any patient with altered mental status or anyone in whom surgery is anticipated.
- **Narcotic pain medications can be reversed with Narcan 0.1mg/kg IV/IM.**
- Start with low dosage of pain medications and titrate upward to desired effect.
- Morphine will cause decreased BP through various drug effects. Fentanyl may also lower BP, but less so than morphine.

RESPIRATORY DISTRESS

History: <ul style="list-style-type: none"> Past medical history Prior episodes/treatments Fever/infection Foreign Body Medications Onset Smoke inhalation Toxic exposure 	Signs and Symptoms: <ul style="list-style-type: none"> Shortness of breath Pursed lip breathing Decreased ability to speak Tachypnea/Hyperpnea Wheezing/rhonchi/rales Use accessory muscles Fever/cough Tachycardia Absent breath sounds (emergent) 	Differential Diagnosis: <ul style="list-style-type: none"> Asthma Anaphylaxis/Allergy Aspiration Pleural effusion Pneumonia Congestive heart failure/Cardiac Pneumothorax Pericardial tamponade Hyperventilation Toxic inhalation (cyanide, CO, etc.)
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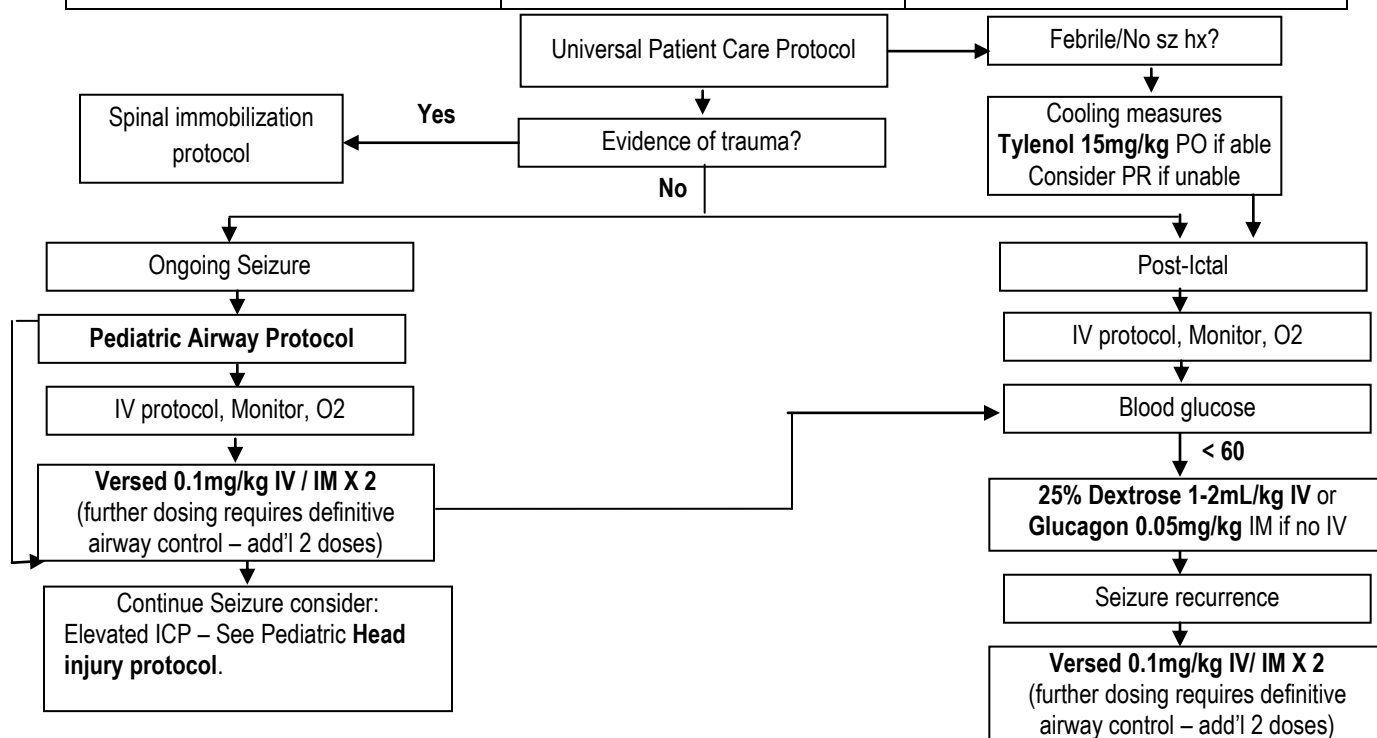


Pearls:

- Albuterol can be administered with spacer or short (6") section of ventilator tubing to increase delivery if patient unable to perform action appropriately. No max dose of albuterol, repeat as needed for continued wheezing.
- Signs of respiratory insufficiency in children are similar to those seen in adults. Fatiguing and lethargy may be seen earlier in pediatric patients.
- CHF in pediatric patients often due to congenital heart disease. May present with poor feeding/sweating during feeding.
- Do not use furosemide in patients with history of allergy to sulfa drugs.
- If epiglottitis suspected (sore throat w/hoarse voice, drooling, stridor, rapid onset) do not attempt to manipulate airway/upset child.
- If possible – allow child to maintain position of comfort – they will maintain their airway through body position.
- Respiratory insufficiency is the most common cause of cardiac arrest in pediatric patients.

PEDIATRIC SEIZURE

History: <ul style="list-style-type: none"> Reported/witnessed seizure activity Previous seizure history Medical alert tag Medications Past medical history Trauma Reported seizure activity Congenital abnormality 	Signs and Symptoms: <ul style="list-style-type: none"> Decreased mental status Seizure activity Somnolence Incontinence Evidence of trauma Loss of consciousness Oral injuries (tongue, buccal) fever 	Differential Diagnosis: <ul style="list-style-type: none"> CNS trauma Tumor/mass/infection Metabolic Hypoxia Electrolyte abnormality Drugs/toxins Hyperthermia Hypoglycemia Febrile Seizure
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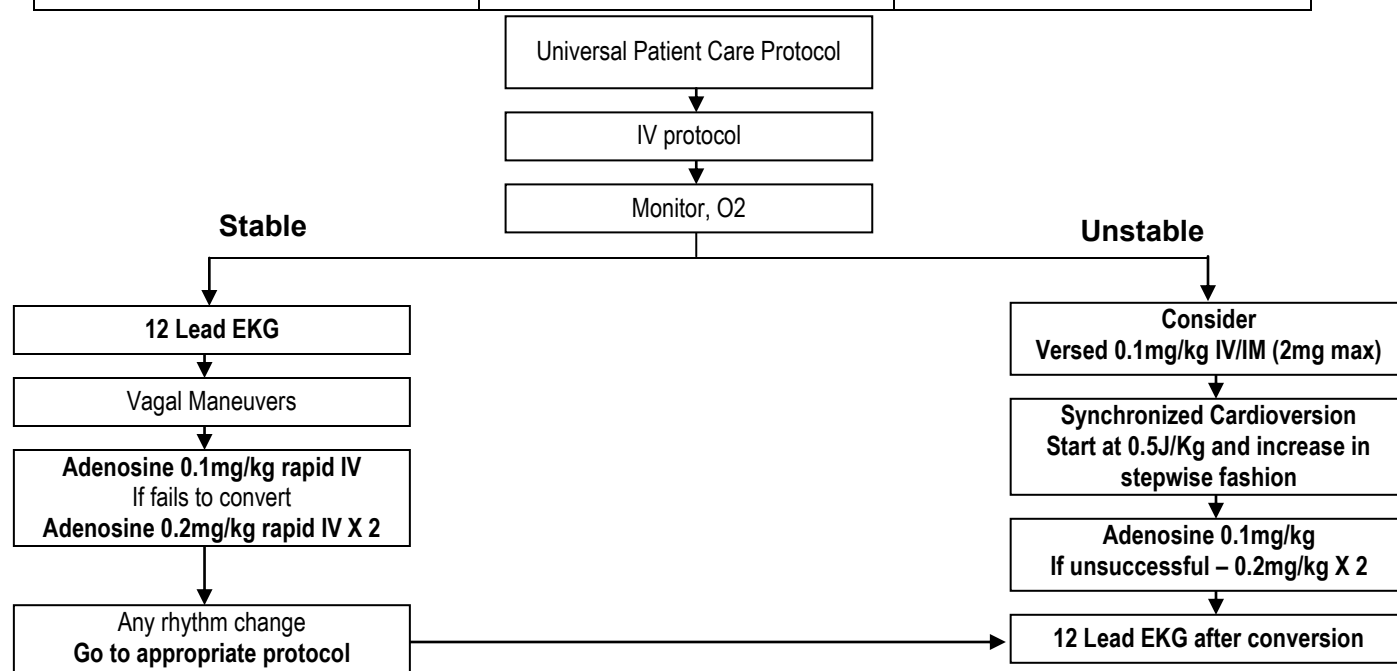


Pearls:

- Status epilepticus defined as seizure > 15min or two or more successive seizures without a period of consciousness/recovery. This is a true emergency requiring rapid airway control, treatment, and transport to nearest suitable MTF.
- Paralysis for airway control does not stop seizure activity** – only hides it. Seizure is a CNS electrical phenomenon and damage is still being done even when no muscular activity seen due to paralysis.
- Anticipate further seizure activity/recurrence and monitor continually.
- Assess probability of toxin, occult trauma, abuse, or substance use.
- Be prepared to assist with ventilations with the use of versed. If airway controlled and ventilating well – may give total of 4 doses of Versed.
- Max doses: Versed 5mg/dose, D25 25mL/dose, Glucagon 1mg/dose.**

SUPRAVENTRICULAR TACHYCARDIA - PEDIATRIC

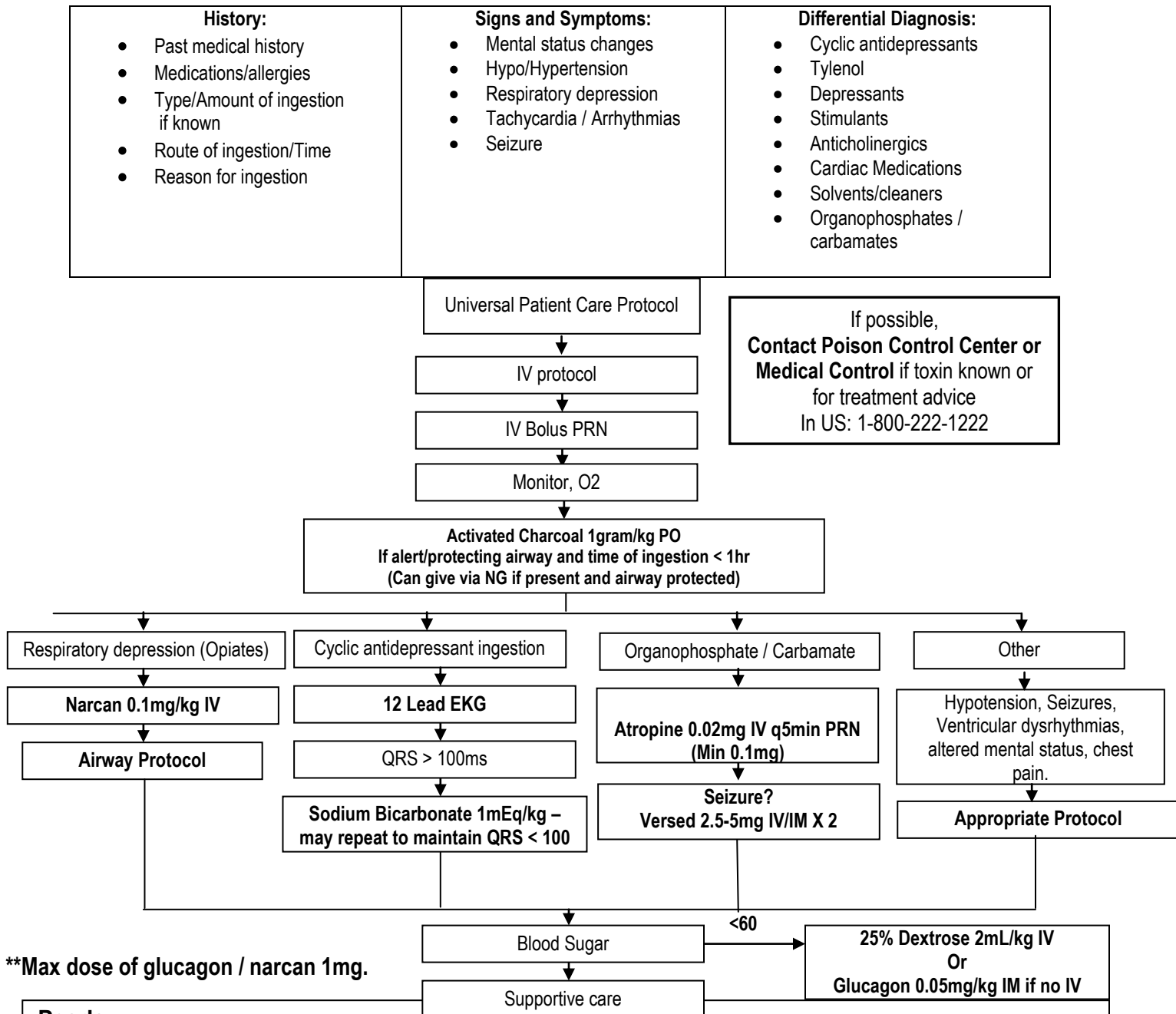
History: <ul style="list-style-type: none"> Past medical history Prior episodes/treatments Medications/Allergies Onset Toxic exposure Syncope/dizziness Chest pain/Shortness of breath Congenital heart diseases 	Signs and Symptoms: <ul style="list-style-type: none"> Heart rate > 180bpm child or > 200bpm infant Pale/cyanosis Vomiting Shortness of breath Chest pain Rapid heart rate/palpitations Dizziness Anxiety 	Differential Diagnosis: <ul style="list-style-type: none"> Congenital heart disease Sinus tachycardia (fear, pain) Hypoglycemia Hypoxia Drug overdose/toxin Tension pneumothorax
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Pearls:

- Evidence of unstable patient includes **ANY: chest pain, altered mental status, hypotension.** These patients should have immediate synchronized cardioversion. Sedation may be administered, but should not significantly delay cardioversion.
- All patients should be warned of discomfort/feeling of heart stopping prior to adenosine administration.
- Adenosine should be given with the “2 syringe technique” – one with adenosine and the other with the saline flush. These should be attached to a 2 port IV adapter and flush should immediately follow drug.**
- Continuous monitoring required for all patients.
- Print monitor strips with any change in rhythm/arrhythmias.
- Vagal maneuvers: blow through 18ga IV catheter, ice water immersion (facial), carotid massage (unilateral only – listen for bruits prior to performing), or having patient blow against closed glottis (“bear down”).
- Maximum dose for adenosine is 6mg for first bolus, then 12mg for additional bolus.**

TOXIC INGESTIONS PEDIATRIC

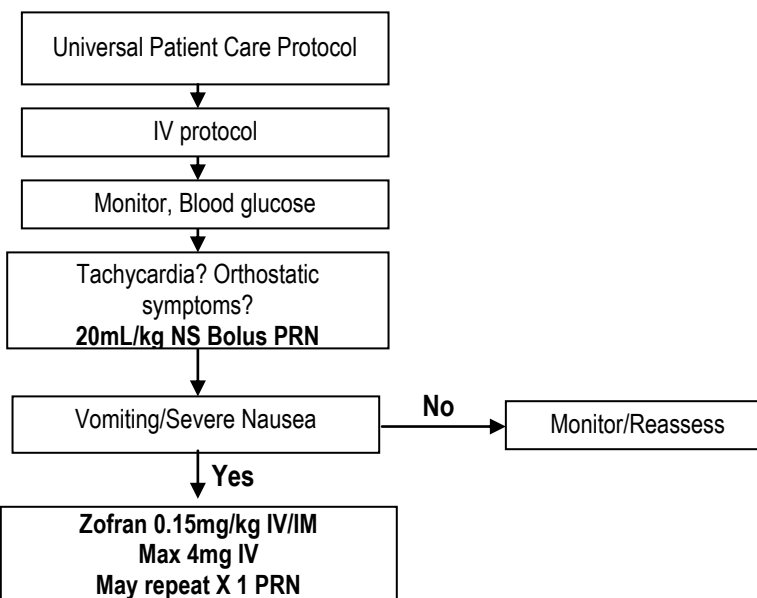


Pearls:

- Do not rely on patient history alone to rule out toxic ingestions. Bring bottles, contents, emesis to ED if possible.
- **General supportive care consists of: continuous monitoring, supplemental O2/airway support, IVF resuscitation as required. This is the keystone of management of toxic ingestions.**
- **Opioids:** Depressed mental status, pinpoint pupils, N/V, respiratory depression, hypotension possible.
- **Anticholinergics:** Altered mental status (mad as a hatter), Hyperthermia (hot as a hare), Mydriasis (Blind as a bat), Flushing (Red as a beet).
- **Stimulants:** Altered mental status, tachycardia, diaphoresis, mydriasis, hyperthermia.
- **Cyclic antidepressants:** hypotension, depressed mental status, respiratory depression, cardiac arrhythmias.
- **Organophosphates / Carbamates (cholinergics):** Salivation, Lacrimation, Urination, Diarrhea, Emesis, Altered mental status.

VOMITING/DIARRHEA

History: <ul style="list-style-type: none"> • Past medical/surgical history • Medications/Allergies • Last meal • Last bowel movement/emesis • Improvement/worsening with food/activity • Duration of symptoms • Sick contacts/Travel • Menstrual history/Pregnancy status • Blood in emesis/diarrhea • Head injury/trauma 	Signs and Symptoms: <ul style="list-style-type: none"> • Pain • Abdominal distention • Constipation • Diarrhea • Anorexia • Vomiting Associated Symptoms: <p>Fever, headache, weakness, malaise, myalgias, cough, dysuria, mental status changes, rash</p>	Differential Diagnosis: <ul style="list-style-type: none"> • CNS injury/mass/infection • Drugs/toxins • Bowel obstruction • Diabetic ketoacidosis • Infections • Gastroenteritis • Food borne/toxic • Appendicitis
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Pearls:

- Suspicion of other underlying condition should prompt immediate referral to appropriate protocol.
- Continually monitor for any decompensation.

PROCEDURES

Certification Requirements:

- All Flight medics with up to date EMT and ACLS certifications who have obtained training and performing the procedure protocols must be evaluated and certified by the Flight Surgeon or Aeromedical Physician Assistant.
- All Flight Medics must receive annual refresher training on all procedural protocols and their interpretation (didactics and practical).
- All Flight Medics must maintain knowledge of all anatomy, equipment, and manual skills associated with procedure and demonstrate this knowledge when requested.
- The Certification Memorandum will be maintained in each medic's folder and protocol binder.

12-LEAD ELECTROCARDIOGRAM

CLINICAL INDICATIONS:

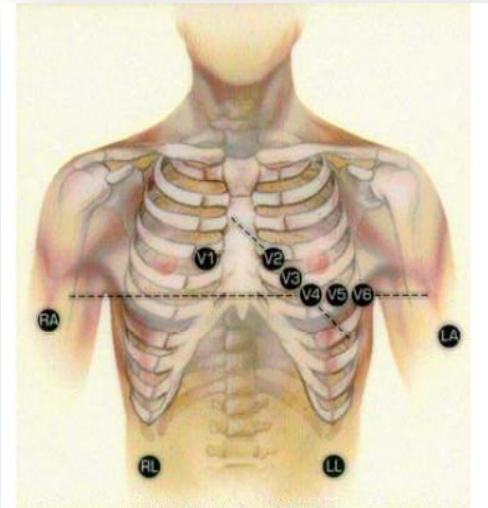
- Suspicion of arrhythmia
- Chest pain believed to be of cardiac origin
- Toxic ingestion with cardiac side-effects

CONTRAINDICATIONS:

- None

PROCEDURE:

- Ensure patient lying flat on bed and place leads as per diagram.
- If patient is unstable, address any emergent issues prior to attempting the 12-lead EKG.
- Once leads are in place, instruct the patient to remain still and limit any movements around the patient (as possible).
- Press button to obtain 12-lead EKG.
- The trained RL1 medic may interpret the EKG and perform any treatments necessary according to pathology seen.
- If questions exist, maintain supportive care and contact medical control if able.
- **Document procedure, results, and vital signs on run sheet following mission.**



AIRWAY CONFIRMATION

CLINICAL INDICATIONS:

- Status post endotracheal intubation to confirm proper placement of endotracheal tube.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Primary/First confirmation of proper placement is always good visualization of tube passing through cords.
- Provider or second individual should listen for bilateral breath sounds and absence of gastric sounds. Also evaluate for equal chest rise.
- Monitor capnography and record results. **This is mandatory for all intubations.**
- Capnometer: Place onto ETT and bag patient 2-3 breaths. Proper placement will result in color change to Gold/Yellow. Esophageal placement will result in a purple color. (**Gold = good, Barney = bad**).
- Esophageal detection device: Squeeze bulb expressing all air out of the EDD. Place this onto end of ETT. Rapid refilling suggests proper placement (The rigid trachea does not collapse and therefore there is no obstruction to air return.) Poor filling or no filling suggests improper placement. (The flaccid esophagus will collapse around ETT preventing refilling.)
- Pulse oxygenation: After a short delay (seconds), the pulse oxygenation should increase to normal range. (This is not reliable in excessively cold patients, methemoglobinemia, or CO poisoning).
- **At any time, doubt as to correct placement should prompt removal of tube and re-attempting/BVM/rescue airway immediately.**
- **Document procedure, results, and vital signs on run sheet following mission.**

BLOOD GLUCOSE ANALYSIS

CLINICAL INDICATIONS:

- Suspicion of blood glucose abnormalities – hyperglycemia/hypoglycemia.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Gather and prepare equipment
- Obtain blood samples for analysis as per manufacturer's recommendations.
- Place blood sample onto reagent strip and place into machine for analysis as per manufacturer recommendations.
- Record result and treat any glucose abnormalities per appropriate protocol.
- Perform quality assurance on glucometers weekly, if any suspicious recordings are noted, and/or per manufacturer recommendations.
- **Document procedure, results, and vital signs on run sheet following mission.**

CRICOTHYROIDOTOMY

CLINICAL INDICATIONS:

- Failed intubation attempts X 3 by the most experienced provider present with inability to ventilate with BVM/high risk to ventilate with BVM.
- Inability to place/ventilate with KingLT device.
- Massive facial trauma or neck trauma precluding the use of orotracheal intubation / KingLT.

CONTRAINDICATIONS:

- Age <10yo
- Anatomical abnormality

PROCEDURE:

- Maintain patient in sniffing position or place them into sniffing position. Utilized in-line stabilization if indicated.
- Re-oxygenate the patient with 100% O₂. Identify and cleanse the cricoid area with betadine / alcohol while oxygenating if possible.
- Using a scalpel, make an adequate (2-3cm) vertical incision over the cricothyroid membrane. Then, using hemostats, bluntly dissect until membrane fully visualized.
- Make an adequate horizontal incision through the cricothyroid membrane into the trachea. Spread incision with either hemostats or scalpel handle.
- Using Tracheal hook, secure distal end of trachea and pass a cric. tube or 6-0 ETT into the trachea. (If ETT used, only insert until just past the cuff, then inflate the cuff.) Secure tube in place and begin to ventilate with BVM/100% O₂.
- Confirm placement with capnography, capnometer, bilateral chest rise/ breath sounds, good PO₂, EtCO₂, lack of increasing SQ air (a small amount is normal).

Document procedure, results, and vital signs on run sheet following mission.

CARDIAC DEFIBRILLATION

CLINICAL INDICATIONS:

- Patient who is in pulseless cardiac arrest with either ventricular fibrillation or ventricular tachycardia seen on monitor.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Ensure patient attached to monitor/defibrillator. If paddles used, ensure that they are several centimeters away from monitor leads to prevent arcing. Use pediatric paddles as indicated – if unavailable and pads used, should place in anterior/posterior position for pediatric patients.
- Set energy level to appropriate level. Start 200J adult (biphasic) or 360J adult (monophasic), or 2J/kg peds.
- Press “charge” button to begin charging machine.
- Ensure all personnel clear of patient and pilots aware of cardioversion.
- Press and hold “shock” button until energy delivered.
- If rhythm converts – treat as per post resuscitation protocol.
- Following shock delivery, immediately begin/return to CPR for 2 minutes before checking for pulse.
- If pediatric patient fails to convert – repeat steps 2-7 above using escalating energy levels.
- **Document procedure, results, and vital signs on run sheet following mission.**

AUTOMATED EXTERNAL DEFIBRILLATOR (AED):

- Turn on power to machine and follow prompts to attach pads to patient and machine.
- Ensure no one touching/moving patient and press the “Analyze” or equivalent button. (If not present, the machine will automatically check the rhythm at dedicated time intervals. A vocal warning will tell you when this is occurring).
- If shock advised, press button to deliver shock and return to CPR for 2 minutes.
- After analysis, if subsequent shocks advised, repeat steps 2-3 up to 3 shocks, until further care arrives, or until no further shock advised. **If no shock advised at any time, CHECK PULSE.** Continue CPR if no pulse. If pulse present, place patient in recovery position and transport.

CHEST TUBE PLACEMENT

CLINICAL INDICATIONS:

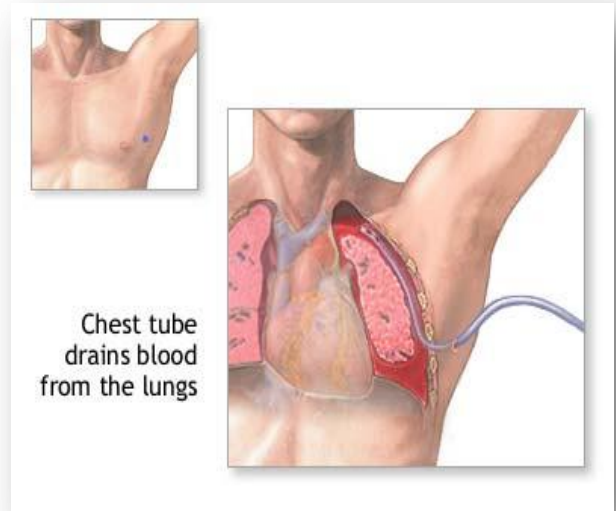
- Pneumothorax + positive pressure ventilation or interfering with oxygenation
- Hemothorax + positive pressure ventilation or interfering with oxygenation
- Chest injury with suspected pneumo/hemothorax as above
- Evidence of tension pneumothorax after needle thoracostomy attempts

CONTRAINDICATIONS:

- Stable patient oxygenating well, no tension PTX
- Blood clotting abnormalities (Relative)

PROCEDURE: (STERILE)

- Ensure all equipment prepared/available: Scalpel, 4X4 gauze, petroleum gauze, suture material (0 – 1-0 silk), 36Fr or larger chest tube, Heimlich valve/Water seal, large Kelly clamp X 2, betadine / skin cleanser, 1-2% lidocaine, 10mL syringe with needle for lidocaine, Sterile gloves.
- If possible, position patient supine with shoulder flexed up and hand under his/her head.
- Identify and clean area of insertion with skin cleanser. Area of insertion should be 4th/5th IC space on injured side.
- Anesthetize the area with lidocaine. Take care to anesthetize the rib if possible by passing needle perpendicular to skin until bone contacted and backing off slightly to inject lidocaine. May also anesthetize the pleura by advancing needle just until air returned and then injecting area while pulling back needle.
- Measure depth of tube by holding over patient's thorax. Approx. depth of insertion is the length from at the entry site when tip of tube at apex of lung. Clamp the tube with Kelly clamp at this measured length.
- Make incision in skin/SQ tissue overlying 5th rib. Ensure incision large enough for insertion of tube/finger.
- Bluntly dissect tissue going over 5th rib with second clamp until pleura is reached. Then puncture the pleura with the clamps. *Holding clamps in hand with index finger on shaft of the instrument will prevent overly deep insertion and subsequent lung injury.* Open clamps as wide as possible and remove them, enlarging the pleural opening.
- Place finger into opening and palpate for any adhesions.
- Advance tube into opening directing the tip of the tube towards the lung apex until resistance is met or adequate length is inserted. (Holes near the tip of the chest tube must all enter the pleural space.)
- Holding tube in place – secure it with a purse string suture / roman sandle suture. Apply petroleum gauze / 4X4's and secure tube to patient's side with foam tape.
- Apply suction to tube/Heimlich valve and remove clamp.
- **Document procedure, results, and vital signs on run sheet following mission.**



CHEST TUBE TROUBLESHOOTING:

- Ensure tube not clamped/kinked and that suction is working.
- Ensure tube has not become dislodged.
- If evidence of tension PTX – Cut attachments from end of chest tube (suction adapter/Heimlich valves/suction devices) to convert to open PTX.

EXTERNAL CARDIAC PACING

CLINICAL INDICATIONS:

- Patients with pulse rate <60 (or appropriate for age) and signs of inadequate cerebral or end-organ perfusion.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Ensure patient attached to monitor and defibrillator with external cardiac pacing capabilities.
- Time-permitting, ensure adequate IV/IO access prior to pacing. Also, may administer sedative agent (Versed) prior to beginning pacing.
- Turn selector switch to “Pace”.
- Set rate to twice the patients intrinsic rate (often 70-80 for adult, 100 for pediatric).
- Set energy level to lowest setting and gradually increase until capture is obtained (each pacer spike followed by QRS).
- Once capture obtained, ensure pulse and vital signs correspond with pacing. Evaluate patient for improvement. Monitor and continue sedation as needed.
- If fails to capture at maximal setting, discontinue pacer.
- At any time, if patient degenerates and needs CPR – begin compressions immediately. Pacer pads are insulated and it is okay to perform compressions with pacer running.
- **Document procedure, results, and vital signs on run sheet following mission.**

HEMORRHAGE

CONTROL PROCEDURES

CLINICAL INDICATIONS:

- Hemorrhage

CONTRAINICATIONS:

- None

PROCEDURE:

- Rapid bleeding/Arterial source recognized (extremities) – Immediate application of tourniquet(s) to stop bleeding.
- All other bleeding:
 - Apply dry gauze dressing and apply direct pressure. Must apply adequate force to compress vessels.
 - If bandage soaks through or continued bleeding noted after 10min., apply a pressure dressing to the wound if applicable (trauma dressing). Trauma bandages are encouraged for early use and can be used in place of dry gauze.
 - Maintain pressure on wound at all times – only checking in 10min intervals or if bandages soak through.
 - If unable to control with these measures, may apply Combat Gauze bandage. To use, remove as much blood from the area as possible and then apply the active side of the dressing material to the wound and hold pressure for 2-5min. In penetrating injuries to the abdomen, after removing blood, Combat Gauze can be pushed into the wound and pressure held as above to encourage clotting. Do not remove bandage after placement.
 - If unable to control bleeding in extremity wounds with above, apply tourniquet.
 - Penetrating abdominal/thoracic injuries require a large amount of pressure to compress vessels.
 - In pelvic wounds – utilize pelvic binding to limit capacity for hemorrhage (tie pelvis with sheet/commercial binder).
 - Administer IVs as per protocol – use care with internal bleeding so as not to raise BP to “normal” levels, which may cause further hemorrhaging from clot dislodgement.
- **Document procedure, results, and vital signs on run sheet following mission.**

KING LT

CLINICAL INDICATIONS:

Patient who has inadequate respiratory drive or respiratory failure due to any reason (altered mental status, trauma, infection, etc.) other than airway burns, anaphylaxis, or other causes of airway swelling/obstruction.

CONTRAINDICATIONS:

- Massive upper airway trauma distorting anatomy
- Penetrating neck trauma

PROCEDURE:

- Prepare, position, and pre-oxygenate the patient with 100% O₂. Ensure patient on monitors if possible.
- Select appropriate size KingLT and ensure proper cuff inflation/deflation.
- Lubricate with water-soluble jelly.
- Advance tube towards posterior pharynx until seated in correct position.
- Inflate balloon as per package insert and attempt to ventilate with BVM.
- If good airflow/chest rise/PO₂, secure KingLT in place and ventilate patient with BVM/Vent.
- If unable to ventilate/resistance, leave first KingLT in place, deflate balloon, and pass a second KingLT in the same manner as the first (this should only be able to enter the esophagus as the first should have went into the trachea – 5-10%). Once second KingLT in place, remove first and inflate the cuff on the second device. Attempt to bag as above. If successful, ventilate patient.
- Following procedure; document procedure, outcome, and patient vital signs on run sheet.

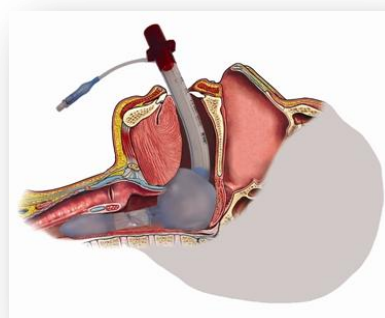
safe reliable efficient

Additionally, the KING LT is:

- Designed to allow up to 30 cm H₂O positive ventilation pressure
- Reusable up to 50 autoclave cycles

COLOR	Yellow	Red	Purple
SIZE	3	4	5
PATIENT SIZE	Adults less than 61" (155 cm) in height	Adult 61"-71" (155-180 cm) in height	Adults greater than 71" (180 cm) in height
CUFF PRESSURE	60 cmH ₂ O	60 cmH ₂ O	60 cmH ₂ O
CUFF VOLUME (# Filled with Syringe)	60 ml	80 ml	90 ml
ITEM #	KLT 103	KLT 104	KLT 105

CUFF PRESSURE GAUGE ITEM # KLT 900



NASOPHARYNGEAL AIRWAY



CLINICAL INDICATIONS:

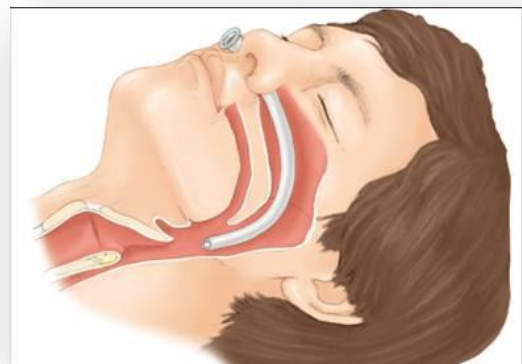
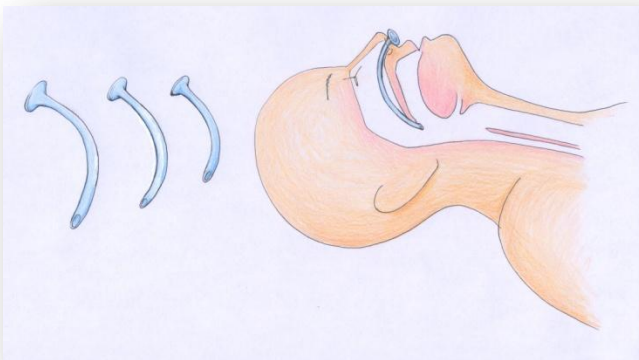
- Depressed mental status with need for airway augmentation to ensure patency.

CONTRAINDICATIONS:

- Patient at high-risk of aspiration and/or unable to protect airway
- Massive facial trauma, burns, or suspicion of basilar skull fracture (CSF otorrhea, Battle's sign, Raccoon eyes, mechanism).

PROCEDURE:

- Position patient in the sniffing position.
- Select appropriate sized NP tube and lubricate with water-soluble jelly. (Can measure tube by placing exterior (lipped) end next to nare and tip should reach to angle of mandible.)
- Select most patent nare and pass tube in a posterior – **not superior** – direction. If resistance is met, attempt to corkscrew slightly or remove and attempt in other nare. If unsuccessful, try the next smallest sized tube.
- Pass tube until lip of NP tube rests against nare.
- Bag patient with BVM/mask as needed.
- **Document procedure, results, and vital signs on run sheet following mission.**



NEEDLE CRICOTHYROIDOTOMY

CLINICAL INDICATIONS:

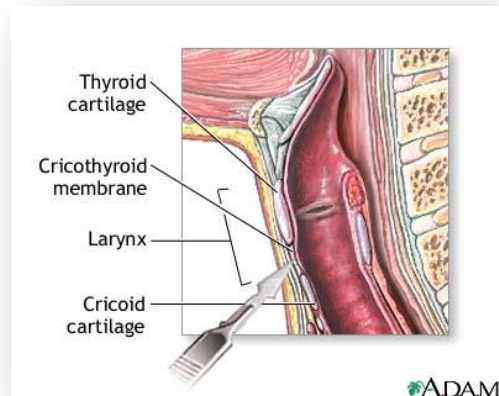
- Child < 10yo in whom open cricothyroidotomy is contraindicated with:
 - Failed intubation attempts X 3 by the most experienced provider present with inability to ventilate with BVM/high risk to ventilate with BVM.
 - Inability to place/ventilate with KingLT device.
 - Massive facial trauma or neck trauma precluding the use of orotracheal intubation/KingLT.

CONTRAINDICATIONS:

- Ability to ventilate adequately with BVM.
- Prolonged time to definitive care (relative).

PROCEDURE:

- Maintain patient in sniffing position or place them into sniffing position. Utilized in-line stabilization if indicated.
- Oxygenate the patient with 100% O₂. Identify and cleanse the cricoid area with betadine/alcohol while oxygenating if possible.
- Using a 14Ga IV attached to a 3mL syringe, puncture the cricothyroid membrane at a 90deg angle. **Do not advance needle once air returned.**
- Change angle to 45deg and **advance Catheter only**. Should advance with no resistance. Remove needle and syringe.
- Secure catheter in place. Remove needle and plunger from syringe and place an adapter from a 7-0ETT on end of syringe in place of plunger. Attach this to the catheter.
- Attach a BVM attached to 100% O₂ to the adapter/syringe and ventilate. A large amount of resistance will be felt due to the small catheter size. Evaluate for chest rise and oxygenation. A long I:E ratio may be needed (i.e. 1:10).

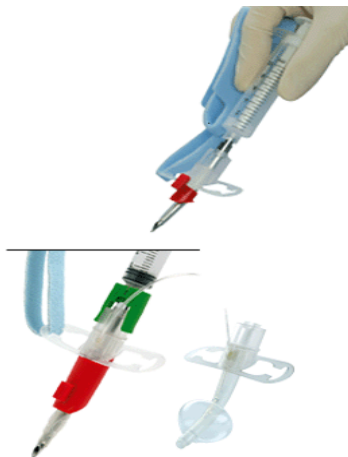


Note: Needle cricothyroidotomy only allows for oxygenation, not ventilation. It is meant as a temporizing measure until definitive care – tracheostomy – can be performed at an MTF. This airway should be used for only 20-30min maximum if able. **Document procedure, results, and vital signs on run sheet following mission.**

QUICKTRACH

- I. Supine Position. Hyperextend the neck. If suspected cervical trauma, do not hyperextend. Secure larynx laterally between the thumb and forefinger. Find the cricothyroid ligament (midline between the thyroid cartilage and cricoid cartilage). This is the puncture site
- II. Firmly grasp the device and puncture cricothyroid ligament at a 90 degree angle. No incision is necessary due to the conical shape of needle. Thus, minimizing risk of bleeding with the smallest opening is made.
- III. After puncturing the cricothyroid ligament, check entry of the needle into trachea by aspirating air through the syringe. If air is present, needle is properly placed. Change angle to 60 degrees and advance the device forward into the trachea to the level of the stopper. Stopper reduces risk of damage to the posterior wall of the trachea.
- IV. Remove stopper. Hold needle and syringe and slide plastic cannula along the needle into the trachea (toward the feet) until the flange rests on the neck. Carefully, remove the needle and syringe. Secure the cannula with neck tape, apply the connecting tube to the 15mm connection, and connect the other end to the resuscitation bag or ventilation circuit.

NOTE: Should no aspiration of air in Step 3 because of extremely thick neck, it is possible to remove the stopper and carefully insert the needle further until entrance into trachea is made. Once verified, continue with Step 5. **Peds: Size 2.0 mm Adults: 4.0 mm**



NEEDLE THORACOSTOMY

CLINICAL INDICATIONS:

- Suspicion of tension pneumothorax compromising patient's hemodynamic status.
- Symptoms/Signs of tension pneumothorax may include: Shortness of breath, chest pain, distended neck vessels, hypotension, tracheal deviation away from affected side, lack of breath sounds on affected side, loud percussion on affected side, or cardiac arrest.

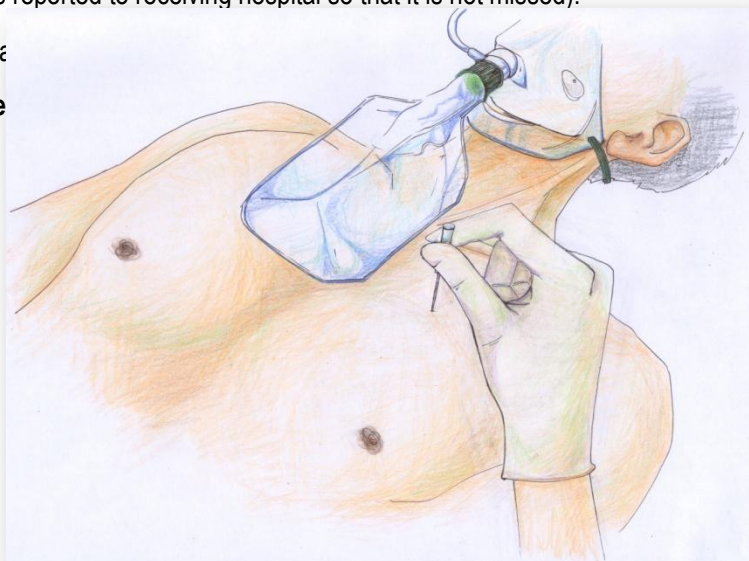
CONTRAINDICATIONS:

- None

PROCEDURE:

- Once tension pneumothorax suspected, identify 2nd intercostal space on affected side (rib palpable just under clavicle is 2nd rib).
- Clean area if possible with betadine/alcohol, but do not delay treatment for this step.
- Using a 14Ga IV (preferable 3.75"), puncture skin at 90deg angle just over top of 3rd rib (prevents damage to the neurovascular bundle which runs below each rib) and advance until gush of air is returned.
- Remove needle and secure catheter in place.
- If unsuccessful/unable to penetrate to pleural space and confident that tension pneumothorax present on that side, may attempt same procedure in mid-axillary/anterior-axillary line in 4th ICS (ensure that placement in this area is reported to receiving hospital so that it is not missed).
- In cases of ca

Document proce



POST-OPERATIVE & INTERFACILITY TRANSFER

CLINICAL INDICATIONS:

- Patient at outlying MTF requiring transfer to higher level of care for more definitive surgery/treatment

CONTRAINDICATIONS:

- Patient not stable for transfer (relative)

PROCEDURE:

- Upon receiving 9-line MEDEVAC request, ensure all medical equipment necessary for patient transport is available/ready. It is preferable to have back-up batteries/equipment if available.
- Assess patient history, type(s) of injuries, and any surgeries performed prior to transfer.
- On arrival, ensure that patient is prepared for transport using **MITES**:
 - **MEDICATIONS**: Record last medication/dosage. Request medications as needed for transfer.
 - **INVASIVE PROCEDURES DONE**: Ensure all necessary invasive procedures have been completed prior to flight to include: intubation/airway control, chest tubes with Heimlich valves (do not clamp), nasogastric/orogastric tube in place, and Foley catheter.
 - **TUBE/TOURNIQUET**: Check ETT placement and record size, depth at teeth, and properly secured. Check all tourniquets to ensure that there is no active bleeding.
 - **EVERY VITAL SIGN**: Assess and record all vital signs prior to arrival, to include: blood pressure, pulse, temperature, respirations, and PO2. If any abnormalities exist – address prior to departure.
 - **SECURED FOR TRANSPORT**: Ensure patient properly prepared for transport and that proper hypothermia precautions have been taken. This should include assurance of appropriate spinal immobilization.
- After transferring to helicopter – recheck all lines/tubes/tourniquets to ensure none were dislodged during movement.
- The flight medic may use any medications given by the transferring facility used for the care of the patient (i.e. propofol for sedation, etc.), provided that they are knowledgeable of the medication and receive instruction/dosing parameters from the transferring facility prior to departure.
- Any in-flight problems should be addressed per appropriate protocol. Continued problems should prompt contacting medical control as soon as it is possible.

- Document any procedures, their results, and vital signs on run sheet following mission.

RAPID SEQUENCE INTUBATION

CLINICAL INDICATIONS:

- Respiratory failure
- Patient who has suffered airway burns or presents with signs of allergic reaction/allergy or other disorder which threatens to obstruct airway preventing adequate respirations.

CONTRAINDICATIONS:

- Massive upper airway trauma distorting anatomy
- Penetrating neck trauma

PROCEDURE (6P'S):

Prepare: Ensure all equipment ready/functional (including rescue airway) and patient positioned/prepared. Ensure pt. on monitor, to include PO2.

Pre-oxygenation: Have patient breath 100% O2 for several (at least five) minutes prior to intubation. If this is not possible, have patient take 3-5 deep breaths while on 100% O2. Breaths can be delivered/assisted as needed with BVM.

Pre-medication: This can begin during pre-oxygenation and should take place 1-2min prior to intubation. Pretreatment medications:

- Lidocaine +/- Fentanyl for head injury
- Atropine in Pediatric Patients

Paralysis/Sedation: Standard paralysis/sedation should consist of etomidate followed in approx. 1min by succinylcholine. Rocuronium or vecuronium can be used, but is not recommended as first-line due to long duration of action. Sedation should always be performed prior to paralysis. Wait until fasciculations seen and jaw "loose" to attempt visualization.

Pass the Tube: Visualization of the cords/arytenoids cartilages should be noted / documented. Tube must be seen passing these structures. Do not use excessive force as this can damage the cords.

Post-Flight: Once ETT in place, inflate bulb and begin bagging patient – do not let go of tube until secured with tape or commercial device. Placement should be confirmed with >1 method, Capnography preferred. Other methods: Capnometer, Esophageal detection device, Bilateral equal chest rise, PO2 rise/maintained >95%, Equal bilateral breath sounds.

Document procedure, results, and vital signs on run sheet following mission. Procedure should be documented on intubation record form and maintained with patient record.

RSI MEDICATIONS

Pretreatment:

Lidocaine 1.5mg/kg
Fentanyl 50-100mcg
Atropine 0.02mg/kg (Min 0.1mg)

Induction Agents:

Etomidate 0.3mg/kg
Propofol 1-2mg/kg
Ketamine 1-2mg/kg

Paralytics:

Succinylcholine 1.5mg/kg
Rocuronium 1mg/kg
Vecuronium 0.1-0.15mg/kg

Sedatives:

Midazolam 0.1mg/kg
Fentanyl 0.5-2mcg/kg
Propofol 0.5-1mg/kg

SPINAL EVALUATION & IMMOBILIZATION

CLINICAL INDICATIONS:

- Patient with suspected traumatic injury to spinal column/cord.
- Patient with significant mechanism of injury in whom spinal injury cannot be ruled out.
- Patients who have suffered head injuries or other distracting injuries with/without altered mental status in whom spinal injury cannot be ruled out.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Any patient who has suffered multiple trauma, falls from > 6ft, significant trauma above the clavicles, or blast injuries. Also, any patient who complains of neck/back pain following traumatic injury of any kind should be spinally immobilized.
- Evaluation should take place after the primary survey and all emergent procedures completed. However, during the primary survey, the spine should be protected by manual in-line stabilization/limited movement prior to completion of spinal examination. This does not apply to situations in which imminent danger exists and immediate movement is necessary.
- Maintaining spinal stability, log-roll the patient onto their side and palpate the spinal column for any step-off, deformity, or tenderness to palpation. If any of this exists, pt should be rolled back onto a spinal board, if available.
- After palpation, test upper and lower gross motor function by having patient move arms and legs slightly.
- Place patient into a rigid C-collar and then apply head blocks with tape to the spinal board. **A C-collar itself does not provide adequate stabilization if unstable injuries exist.**
- In pregnant patients, place blocks/padding under the right hip to elevate it. This relieves pressure on the IVC and improves venous return to the heart.
- **Document any procedures, their results, and vital signs on run sheet following mission.**



SYNCHRONIZED CARDIOVERSION

CLINICAL INDICATIONS:

- Unstable patient with tachy-dysrhythmia noted on monitor/EKG.
- Patient who has failed conservative and/or chemical cardioversion.
- Patient not pulseless.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Ensure patient attached to monitor/defibrillator with synchronized cardioversion capability.
- Time-permitting, ensure adequate IV/IO access present. Ensure that unsynchronized cardioversion/defibrillation capabilities present in case patient degenerates into other dysrhythmia.
- Consider use of sedating medication (i.e. Versed 0.1mg/kg (5mg max/dose)) prior to delivery of shock.
Note: This step is not mandatory and should not delay appropriate management of emergent condition.
- Set energy level to appropriate level. Usually starting at 50J/100J in adults or 0.5J/kg/1J/kg in children for atrial/ventricular arrhythmias, respectively.
- Select **Synchronized Cardioversion** option. This should result in machine displaying “**SYNC**” as well as tracking electrical activity (arrow or highlighted segment of EKG).
- Ensure all personnel clear of patient and pilots aware of cardioversion.
- Press and hold “shock” button until energy delivered. (This may take several seconds for machine to synchronize with cardiac cycle. Shock is not immediately delivered as in defibrillation.)
- If rhythm converts – monitor and treat as appropriate.
- If fails to convert – repeat steps 4-7 above using escalating energy levels. If patient degenerates, treat as per appropriate protocol/CPR. **(Note: Most machines require pushing the “SYNC” after each shock if synchronized cardioversion to be repeated, failure to do so will result in delivery of an unsynchronized / defibrillatory shock.)**
- Document procedure, results, and vital signs on run sheet following mission.

TOURNIQUET APPLICATION

CLINICAL INDICATIONS:

- Extremity trauma/amputation with ongoing external hemorrhage.

CONTRAINDICATIONS:

- None

PROCEDURE:

- Remove clothing as necessary to visualize bleeding area.
- Place tourniquet (commercial or any 2" wide piece of fabric/leather/etc.) proximal to wound. Tourniquet should be placed as high as possible above the injury, proximal or distal to joints, as appropriate.
- Tighten tourniquet by twisting included rod (commercial) or piece of 6" rigid material (stick, etc) until bleeding stops.
- Secure ends of tension bar to prevent unwinding.
- Document presence of tourniquet and time of placement on patient (forehead). ("T" signifies tourniquet). Do not cover tourniquet.
- Recheck tourniquet intermittently (Q15min) and after any movements to ensure no new bleeding/loosening has occurred.
- **Do Not Remove/Loosen Tourniquet once in place.**
- **Document procedure, results, and vital signs on run sheet following mission.**



VASCULAR ACCESS

(INTRAOSSEOUS)

CLINICAL INDICATIONS:

- Need for intravenous access to provide resuscitative fluids and/or medications with inability to obtain adequate peripheral intravenous access. (2 failed attempts or > 90sec).
- Anticipated need for intravenous access in emergency patients.

CONTRAINDICATIONS:

- Cellulitis overlying puncture site.
- Injury proximal to puncture site (relative – site dependent).
- FAST 1 device contraindicated in pediatric patients (<18yo).

PROCEDURE:

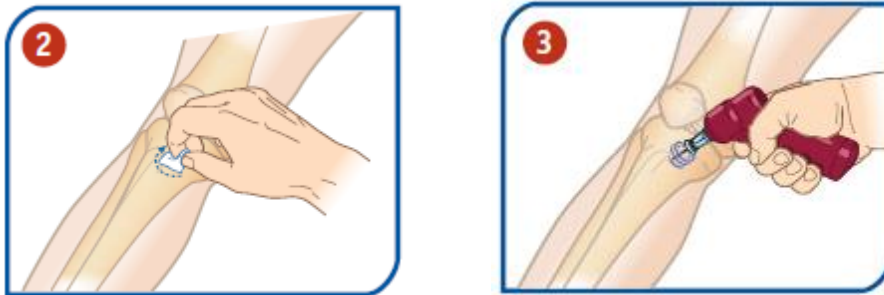
- Prepare all necessary equipment: PPE, IO device, betadine scrub, and IV tubing.
- Ensure all IV tubing / hepslocks flushed prior to attempting IV.
- Identify appropriate puncture area as follows:
 - **Fast 1**
 - **Sternum – use site marker included in package.**
 - **Easy IO**
 - **Proximal tibia – 2cm (2 finger widths) distal to tibial tuberosity on medial aspect.**
 - **Proximal humerus – 2cm (2 finger widths) distal to greater tuberosity on lateral aspect.**
 - **Distal tibia – 2 cm (2 finger widths) proximal to medial malleolus.**
 - **Manual IO**
 - **Proximal tibia and distal tibia – same as Easy IO site.**
- Cleanse area overlying puncture site well. Failure to appropriately disinfect the area can lead to bone infections.
- Applying firm pressure, puncture skin at 90deg angle. Puncture bone (felt as firm resistance followed by “pop”).
- Attempt to aspirate blood then flush. **IO should flush easily – this is confirmation of placement, not aspiration of blood.** (May add 1% lidocaine without epinephrine to flush to decrease pain associated with flushing.) If flushes easily – attach IV line and use as needed.
- Constantly monitor for increased tension in muscular compartments as misplacement into a compartment with subsequent fluid administration can lead to iatrogenic compartment syndrome.
- **Document procedure, results, and vital signs on run sheet following mission.**

EASY I/O PROCEDURE

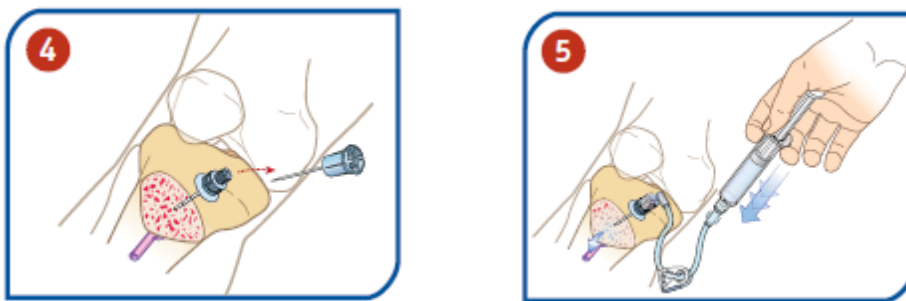
STEP 1: Locate Site



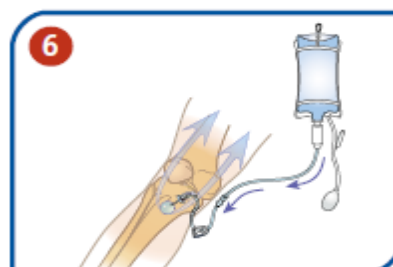
STEP 2: Clean Area, Attach Easy IO Needle & Drill



STEP 3: Remove Stylet From Catheter; Attach primed EZ-Connect & Flush with 10 ml NS



STEP 4: Start Infusion (Use Pressure)



VASCULAR ACCESS (INTRAVENOUS)

CLINICAL INDICATIONS:

- Need for intravenous access to provide resuscitative fluids and/or medications.
- Anticipated need for intravenous access in emergency patients.

CONTRAINDICATIONS:

- Injuries proximal to IV site / ipsilateral to IV site (relative).

PROCEDURE:

- Prepare all necessary equipment: PPE, tourniquet, IV catheters, alcohol/betadine wipe, heparin or IV tubing, IVFs if administering, and tape/securing device.
- Ensure all IV tubing / heparins flushed prior to attempting IV.
- Place tourniquet proximal to anticipated IV puncture site.
- Identify vein to be cannulated and cleanse overlying area with alcohol / betadine.
- While holding traction on skin/vessel, cannulate the vessel (use a shallow angle of attack with the needle). Once flash returned, advance slightly to ensure catheter in vessel, then advance catheter only fully into vessel. (Should pass without resistance).
- While holding pressure proximally on vein, remove tourniquet and needle. Attach 20mL NS flush and flush IV – this fluid should flow easily into the vein – any resistance suggests missed attempt or “blown” vein. (Note: If blood samples being drawn – they should be taken prior to removing tourniquet and always prior to flush (after flushing – may obtain dilute sample which will alter results).
- Secure in place with tape.
- Repeat until 2 IV sites have been established and are functional.
- **Document procedure, results, and vital signs on run sheet following mission.**

VENTILATOR MANAGEMENT

CLINICAL INDICATIONS:

- Patient received from transferring facility who is intubated and requires ventilatory support.
- Patient requiring intubation in the field and subsequent respiratory support.

CONTRAINDICATIONS:

- Equipment malfunction/failure

PROCEDURE:

- Turn on ventilator and ensure that machine is functional and battery is charged.
- Attach ventilator tubing and O2 tubing to machine.
- If patient is a transfer and already on vent, maintain ventilator settings from MTF.
- **If patient “newly” on ventilator, initial settings should include:**
 - **Mode: AC or SIMV**
 - **Rate: 10-16bpm (or adequate rate for pediatric patient)**
 - **FiO2: 100%**
 - **I:E ratio: 1:2 – 1:4**
 - **Tidal Volume: 6-10mL/kg**
 - **PEEP: 5**
- Monitor waveform on machine and patient to ensure not “breath stacking” – if this occurs, a high-pressure alarm may sound. However, if breath stacking suspected even in absence of alarm – disconnect tubing and allow exhalation. Increase I:E.
- If at any time patient begins to desaturate or develop respiratory problems – check rapidly to ensure that vent did not fail and O2 tank not empty. Immediately disconnect ventilator and ventilate patient with BVM and 100% O2. If this resolves problem or vent failed, continue to bag patient. Then titrate FiO2 down as much as possible while keeping O2 sat @ 98-100% (Goal FiO2 <60%) in order to attempt to conserve oxygen for long flights.
- If problem does not resolve, ensure tube did not move during transfer. If advanced – pull back to original length and attempt to bag. If this fails, ensure equal chest rise with breaths and that a tension pneumothorax has not developed (if chest tube in place, ensure it is functioning). If tension pneumothorax suspected, perform immediate needle thoracostomy.
- If tube has pulled farther out of trachea, DO NOT ATTEMPT TO ADVANCE IT. Pull tube and attempt BVM. If this fixes problem, continue to bag patient.
- **Document procedure, results, and vital signs on run sheet following mission.**

ALTITUDE PHYSIOLOGY AND PATIENT TRANSFER

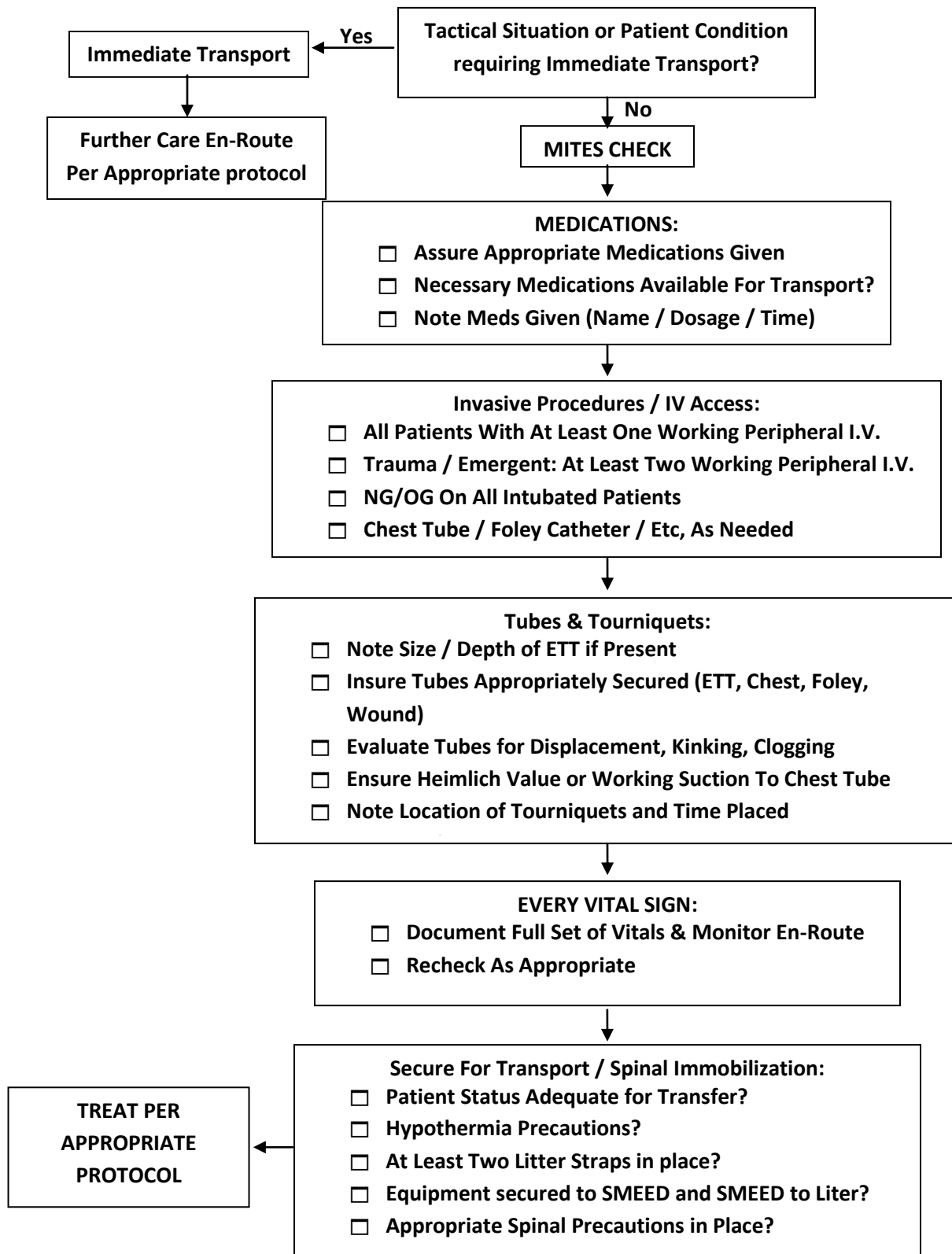
ALTITUDE CONCERNS FOR AEROMEDICAL TRANSFERS:

- **Gas expansion** occurs as altitude above sea level increases. The volume of a gas will roughly double at 18,000' MSL (1/2 Sea level atmospheric pressure). This will typically not affect the operational ceiling for the UH-60 Blackhawk during MEDEVAC operations. Certain conditions and precautions to note:
 - ✓ **Air embolism / Decompression illness** – This is the only absolute contraindication to transport of patients at altitude. These patients should be transferred at sea level or in an A/C capable of cabin pressurization to sea level.
 - ✓ **Pneumothorax** – There is little risk of developing a tension PTX due to gas expansion from altitude during typical MEDEVAC flights in rotary-wing A/C. However, altitude should be limited when possible to <10,000' MSL. Prophylactic chest tubes (for altitude-related concerns) are recommended for any flights above 10,000' MSL.
 - ✓ **Gastric distention** – Gas expansion does increase the risk of vomiting and, therefore, aspiration. Therefore, all patients with decreased LOC should have an NG/OG tube placed prior to transfer.
 - ✓ **Head injury** – As with PTX, there is little concern of altitude related elevation of elevated ICP in head injured patients. Any evidence of elevated ICP should result in treatment per protocol. Altitude restrictions do not differ from those listed for PTX. Constant vigilance should be maintained for evidence of elevation.
 - ✓ **Eye injury** – Penetrating eye injuries or surgeries may introduce air into the globe. Again, the altitudes obtained for rotary-wing A/C does not pose a risk of elevating the IOP during normal operations.
 - ✓ **Gas filled equipment** – Medical equipment with gas filled bladders also may suffer from interference at high-altitudes. Primarily, ETT cuffs should be evaluated at altitude by testing the pressure of the exterior bladder, or filled with saline instead of air.
- **Flow Rates:** Decreased atmospheric pressure may interfere with IV flow rates and/or pump function. These must be monitored continuously.
- **Hypothermia:** As altitude increases, the temperature will drop. This is further complicated in the UH-60 due to rotor-wash. Therefore, patients must be protected from hypothermia at all times. This includes use of blankets, heaters if available, and closing cabin doors/crew windows during transport.
- **Hypoxia:** Patients are at increased risk of hypoxia during transport at altitude. If transfers are taking place in high-altitude locations, pulse oxygenation should be monitored at all times and the medic/provider should maintain a low threshold for the use of supplemental O₂. At no time should the patient's O₂ be allowed to go below 92% (commercial oximeters read up to 3% off, therefore a sat of

91% may be seen in a patient who is really at 88%.). ***Patients who smoke or have underlying cardiopulmonary disease are at increased risk even at low altitudes.***

- **Dysbarism:** Patients may experience discomfort due to gas expansion in air-filled body spaces (ears/sinuses/teeth). These are typically mild during RW transport, however, if severe, altitude should be held and attempts made to alleviate pain and/or slow rate of ascent/descent.

PRE-TRANSPORT CHECKLIST



PRE-TRANSPORT CHECKLIST (Cont)

PEARLS:

- Any patient with advanced airway requires sedation and paralytic for flight. These should be available in the aircraft for use by **Trained Medics** for use if patient becomes conscious/agitated/combatative. Etc.
- Spinal immobilization should be ensured in all blunt trauma (MVA, Fall, Blast, Combination Trauma, etc) where spinal instability may be suspected. The medic should document if spinal injuries are cleared and who cleared them.
- A minimum of two IV sites in patients with emergent or emerging conditions. At least one should be present in all patients transported by MEDEVAC for any other causes. Rare exceptions may exist (i.e. minor musculoskeletal injury).
- All critical care patients should have continuous cardiac monitoring while in en-route. This may also extend to non-intubated urgent / priority patients under other circumstances (i.e. Acute MI, Atypical Chest Pain, etc).
- **Tactical situation and emergent care should take priority over all other procedures / monitoring.** If unable to perform checks / procedures during flight because of the Tactical / Environmental Conditions (Enemy, Weather, etc.); this must be documented completely in the electronic PCR (Patient Care Report) and briefed to the receiving medical facility. Continue with monitoring & procedures as soon as situation allows.

FOLEY CATHETER PLACEMENT

CLINICAL INDICATIONS:

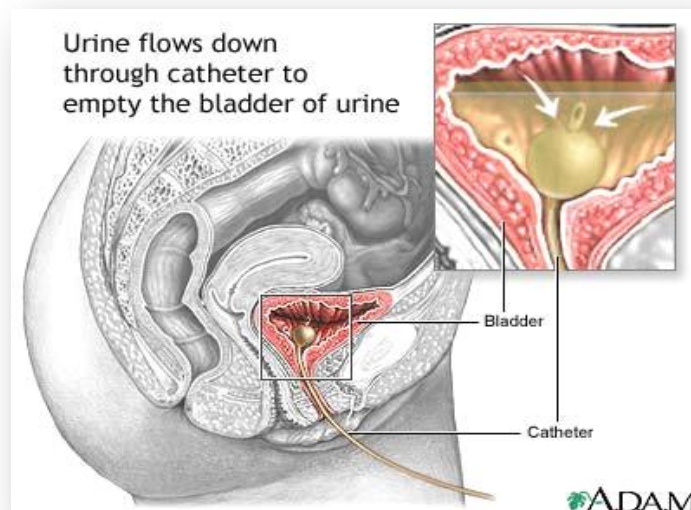
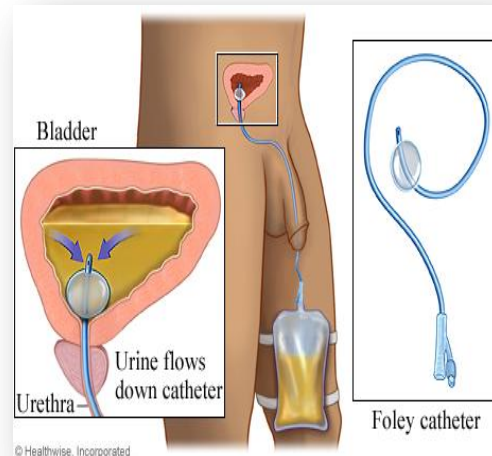
- Bladder distention in an unconscious person, or for blockage/inability to urinate in conscious person.
- Allows for accurate monitoring of output for fluid management.

CONTRAINDICATIONS:

- Known or suspected urethral disruption resulting from pelvic trauma.
- Combative or uncooperative patient.

PROCEDURE:

- Choose appropriate catheter (16-18 for adults) and ready equipment.
- Position patient. Females in supine position with legs abducted. Cleanse urethra and surrounding area with antiseptic solution. Isolate area with drapes provided.
- Insert xylocaine jelly provided into urethra with the syringe provided.
- Insert catheter into urethra. For **females** advance the catheter approx. 3 inches. For **males**, pass catheter into the bladder the full length to the junction of the catheter and inflation port for balloon. Once urine is obtained, inflate balloon with 5cc NS, then pull catheter outward until balloon against bladder neck.
- Secure catheter to leg with tape to prevent trauma to urethra. Document procedure.



NASO/OROGASTRIC TUBE

CLINICAL INDICATIONS:

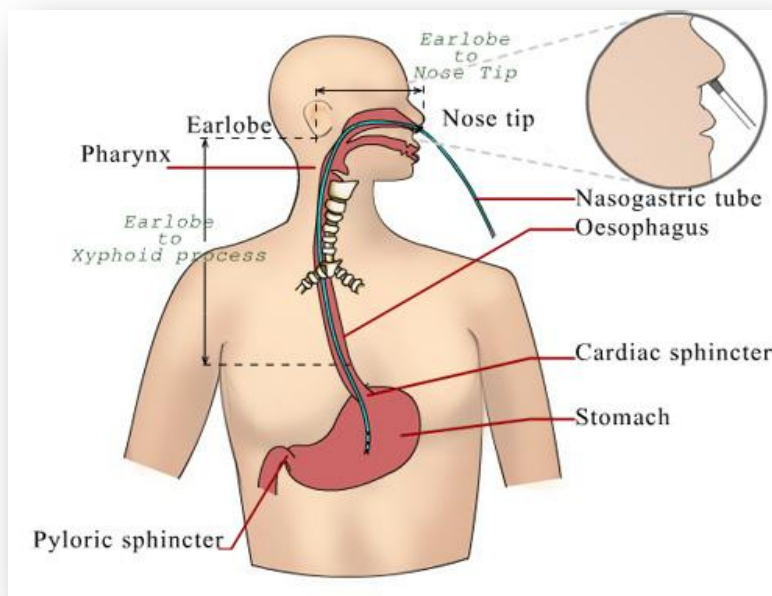
- Enabling gastric decompression, decreasing risk of vomiting and aspiration, obtain sample of gastric contents.
- Allows for gastric lavage in drug overdose or poisoning.

CONTRAINDICATIONS:

- Nasogastric tubes contraindicated in the presence of massive facial trauma, burns, or suspicion of basilar skull fracture (CSF otorrhea, Battle's sign, Raccoon eyes, mechanism). May insert orogastric tube instead.

PROCEDURE:

- If possible, sit patient upright for optimal neck and stomach alignment.
- Measure tubing from bridge of nose to earlobe, then to the point halfway between the end of the sternum and the navel. Mark measured tube with marker.
- Select most patent nare and pass lubricated tube in a posterior – NOT SUPERIOR- direction. If resistance is met, attempt to corkscrew slightly or remove and attempt in other nare.
- Withdraw tube immediately if changes occur in patient's respiratory status, if tube coils in mouth, if the patient begins to cough or becomes cyanotic.
- Advance tube until mark is reached
- Verify tube placement by listening over stomach while air is passed, or examining aspirate when applied to suction. Secure tube. Watch vital sign for changes.



MEDICAL DRUG REFERENCE

The following medications will be given only in accordance with a written order from the supervising provider (Physician/Physician's Assistant). These medications should be pre-drawn into syringes and labeled before transport, and given based on indications delineated by the referring/supervising provider and/or enroute critical care provider

SAFETY IN PREGNANCY CLASSIFICATION

- A. SAFETY ESTABLISHED USING HUMAN STUDIES**
- B. PRESUMED SAFETY BASED ON ANIMAL STUDIES**
- C. UNCERTAIN SAFETY; NO HUMAN AND/OR ANIMAL STUDIES TO VERIFY**
- D. UNSAFE – EVIDENCE OF RISK THAT MAY IN CERTAIN CLINICAL CIRCUMSTANCES BE JUSTIFIABLE.**
- X. HIGHLY UNSAFE- RISK OF USE OUTWEIGHS ANY POSSIBLE BENEFIT**

• Adenosine (Adenocard)

- Preparation: 50 mg/ml 5% & 250mg/ml 25%
- Pregnancy Cat: C
- Indications: SVT, WPW, ACLS Protocol
- Dosing (Adult): **Antidysrhythmic:** >50Kg Body weight: 6mg IV Bolus: may repeat 12mg in 1-2 minutes. May repeat 12mg dose again.
- Dosing (Pediatrics): <50 Kg's Body weight: 0.05mg/kg IV Bolus: Not effective, increase dose by 0.05mg/kg every two minutes to a max of 0.3mg/kg per dos or 12mg's total.
- Onset/Peak/Duration: Half life 10 seconds.
- Side Effects: Atrial tachydysrhythmia, facial flushing, bronchospasm in asthmatics
- Contraindications: 2nd or 3rd degree heart block. AV block. Atrial flutter/fibrillation and Ventricular Tachycardia.

• Albuterol (Proventil)

- Preparation: Aerosol: 90mcg's/actuation. Oral Solution: 2mg/ml. Inhaler: 0.5, 0.83, 1, 2, 5 mg/ml.
- Pregnancy Cat: C
- Indications: Asthma, acute bronchospasms, bronchitis, emphysema, bronchiectasis or other reversal airway obstructions.
- Dosing (Adult): Bronchospasms secondary to COPD, Asthma: 1.25-2.5mg (0.25-0.5ml); mixed in 3 ml saline in nebulizer.
- Dosing (Pediatrics): 0.03 ml/kg nebulized; max 1 ml
- Onset/Peak/Duration: Oral: 30 mins, peak 2-3 hours. Duration: 4-6 hours. Nebulizer: Onset: 5-15 mins. Peak: 30 mins-2hours. Duration: 2-6 hours.
- Side Effects: anxiety, nausea and vomiting.
- Contraindications: tachydysrhythmias, severe cardiac disease

• Alteplase (Activase, tPA)

- Preparation: Powder: 50mg (29 million international units per vial), 100mg (58 million international units per vial), lyophilized powder for injecting 2mg's.
- Pregnancy Cat: C
- Indications: Acute MI (<12 hours old), Acute Ischemic Stroke, Pulmonary Embolism
- Dosing (Adult):
 - Acute MI (<12 hours old): 100mg IV over 3 hours. Mix in 100ml's sterile water for a 1mg/ml.
 - Accelerated: 1.5 hour infusion:
 - 15mg IV bolus (15 ml) over two minutes
 - Then give 0.75 mg/kg (Max: 50mg) over next 30 minutes.
 - Followed by 0.5 mg/kg. (Max: 35mg) over next hour.
 - 3 hour Infusion:
 - 10mg IV bolus (10ml) over two minutes
 - Then give 50mg (50ml) over first hour.
 - Followed by 20mg per hour over the next two hours.
 - Acute Ischemic Stroke (< 3 hrs old)
 - 0.9 mg/kg IV (Max 90 mg) over 1 hr
 - Give 10% of the dose as an IV Bolus over 1 minute
 - Then give remaining 90% over next hr.
 - Pulmonary Embolism
 - 100 mg IV over 2 hrs.
- Dosing (Pediatrics): N/A
- Onset/Peak/Duration: N/A
- Side Effects: Reperfusion Dysrhythmias, bleeding and shock.
- Contraindications: Any within three months: cerebral hemorrhage, AV malformation, neoplasm, recent trauma, aneurysm, recent surgery. Active internal bleeding within 21 days. Major surgery or Trauma within 14 days. Aortic dissection, severe hypertension, known bleeding disorders, prolonged CPR with thoracic trauma. Lumbar Puncture within 7 days. Arterial puncture at a non-compressible site.

• Amiodarone (Cordarone)

- Preparation: 50 mg/ml
- Pregnancy Cat: C
- Indications: Ventricular Fibrillation, Ventricular tachycardia, Atrial Tachycardias (see ACLS algorithm.
- Dosing (Adult): V-Fib/Pulseless V-tach: 300mg IV Push. May repeat 150 mg IVP every 10 3-5 minutes. Max is 2,200 mg in 24 hrs. All other dysrhythmias: 150mg IV over 10 minutes
- Dosing (Pediatrics):
 - For SVT and VT (with pulses) 5 mg/kg IV or IO. Load over 20-60 minutes. Max 300 mg. Repeat to daily max 15 mg/kg (or 2.2 grams).
 - For PEA or V-Fib or pulseless V Tach. 6 mg/kg IV or IO Bolus. Max 300 mg. Repeat to daily max 15 mg/kg (or 2.2 grams).
- Onset/Peak/Duration: 40 day half life.
- Side Effects: Hypotension, Vasodilatation, decreased Heartrate, AV Block, Hepatotoxicity, Increased QTc interval. Vfib, VTACH.
- Contraindications: Bradycardia, 2nd and 3rd degree block, cardiogenic shock, and any drugs that prolong QTc interval.

• Amyl Nitrate

- Preparation: 0.3 ml Ampoule
- Pregnancy Cat: X
- Indications: Cyanide Poisoning Antidote.
- Dosing (Adult): Inhaled 30 Secs then admin O2 for 30 sec. Repeat Continuously.
- Dosing (Pediatrics): Same
- Onset/Peak/Duration: N/A
- Side Effects: hypotension, headache, nausea, methemoglobinemia.
- Contraindications: none

• Aspirin

- Preparation: 325mg, 500mg tablets
- Pregnancy Cat: C
- Indications: Chest Pain associated with Acute Coronary Syndrome, Pain relief
- Dosing (Adult): 325 mg orally for acute MI
- Dosing (Pediatrics): N/A
- Onset/Peak/Duration: N/A
- Side Effects: Gastric Distress, allergic reaction, high doses may cause GI bleeding
- Contraindications: GI bleeding, ulcers, history of hypersensitivity to aspirin or NSAIDs, Aortic Dissection

• Atropine

- Preparation: 0.05mg/ml-1mg/ml (varying concentrations)
- Pregnancy Cat: C
- Indications: Vagolytic, Symptomatic Bradycardia/PEA/Asystole/organophosphate poisoning/Asthma/ RSI Pediatric pretreatment
- Dosing (Adult):
 - **Asystole & PEA**
 - 1.0mg IV Push (See ACLS Algorithm) every 3-5 min up to 0.04 mg/kg total dose.
 - 2-3 mg ET tube every 3-5 min up to 0.04 mg/kg total dose.
 - **Symptomatic Bradycardia**
 - 0.5-1.0 mg IVP every 3-5 min up to 0.04 mg/kg total dose.
 - **Organophosphate / Carbamate Poisoning**
 - 2-5 mg IV every 15-30 minutes (0.05 mg/kg in children) until vital signs improve.
 - **Asthma**
 - 0.4-2.0 mg nebulized in 3 ml Normal Saline (NS)
 - **RSI Pediatric Pretreatment**
 - 0.02 mg/kg. Min 0.1 mg.
- Onset/Peak/Duration: N/A
- Side Effects: Dilated Pupils, Increased Heart Rate VTach, Vfib, Headache, Dry Mouth, constipation, urinary retention, flushing.
- Contraindications: Tachycardia, Glaucoma

• Calcium Chloride 10%

- Preparation: Ampule
- Pregnancy Cat: C
- Indications: Calcium Blocker Toxicity; hypocalcemia with tetany; hyperkalemia; hypermagnesemia.
- Dosing (Adult): **500-1000 mg IV over 5-10 min**
- Dosing (Pediatrics): **10-20 mg/kg (0.1-0.2 ml/kg) IV or IO slowly.**
- Onset/Peak/Duration: Onset Immediate, Duration ½ - 2 hrs
- Side Effects: Decreased Heart rate; Asystole; Decreased BP; Vfib; Coronary and Cerebral Artery Spasm; Nausea, Vomiting; Extravasations causing tissue necrosis
- Contraindications: Vfib, Digitalis Toxicity, hypercalcemia
- Note: precipitates with NaHCO₃ In IV Bag/tubing.

• Calcium Gluconate (10%)

- Preparation: Ampule
- Pregnancy Cat: C
- Indications: Calcium Blocker Overdose; Hypocalcemia; Hyperkalemia Hypermagnesemia.
- Dosing (Adult): **500-1000 mg IV slowly over 5-10 min**
- Dosing (Pediatrics): **60-100 mg/kg (0.6-1.0 ml/kg) IV/IO slowly.**
- Onset/Peak/Duration: Onset 1-5 min, Duration: 12-24 hours
- Side Effects: Decreased Heart rate; Asystole; Decreased BP; Vfib; Coronary and Cerebral Artery Spasm; Nausea, Vomiting; Extravasations causing tissue necrosis
- Contraindications: Vfib, Digitalis Toxicity, hypercalcemia
- Note: precipitates with NaHCO₃ In IV Bag/tubing.

• Diazepam (Valium)

- Preparation:
- Pregnancy Cat: D
- Indications: Anticonvulsant & Sedative / Status Epilepticus
- Dosing (Adult):
 - **Status Epilepticus:** 5-10 mg IV Slowly. May repeat every 10-15 min. Not to exceed (30 mg). May repeat in 2-4 hours if seizures reappear.
 - **Sedation (RSI Protocol):** 5-15 mg IV slowly.
- Dosing (Pediatrics):
 - **Status Epilepticus:**
 - **> five years old:** 1mg IV slowly.
 - **1 month – five years:** 0.2-0.5 mg IV Slowly
 - **Sedation:**
 - **0.1 mg IV**
- Onset/Peak/Duration:
- Side Effects: Decreased respirations, Decreased BP, CNS Depression, venous irritation.
- Contraindications: Head Trauma, Decreased BP, Acute Angle Glaucoma.
- Reversal: **Flumazenil: Adult: IV 0.3 mg over 30 seconds; wait 30 sec, then give 0.3 mg over 30 sec if consciousness does not occur; 0.5mg over 30 sec at intervals of 1 min up to cumulative dose of 3 mg.,**
Pediatric: IV 10mcg (0.1mg/kg), cumulative does of <1 mg.

• Diphenhydramine (Benadryl)

- Preparation: 10 mg/ml, 50 mg/ml
- Pregnancy Cat: B
- Indications: Allergic Reaction / Anaphylaxis
- Dosing (Adult): 25-50 mg IV/IM (IV dosing can be given undiluted over 1 min)
- Dosing (Pediatrics): 1mg/kg IV/IM (same as adults)
- Onset/Peak/Duration: Onset 15-30 min, Peak 1-4 hrs, Duration 4-6 hours
- Side Effects: Sedation, dizziness, muscle weakness, dry mouth, hypotension
- Contraindications: Acute asthma attack, those on MAOIs (antidepressant)

• Dopamine (Intropin)

- Preparation: 400 mg in 250 ml of D5W (1600 mcg/ml)
- Pregnancy Cat: C
- Indications: Positive Inotrope
- Dosing (Adult):
 - **Renal:** 2-5 mcg/kg/min
 - **Inotropic:** 5-10 mcg/kg/min
 - **Pressor:** > 10 mcg/kg/min
- Dosing (Pediatrics)
- Onset/Peak/Duration:
- Side Effects: Tachy-dysrhythmias , VT, VF, HTN, N/V, Headache, Ischemia, AMI
- Relative Contraindications: Increased HR, HTN
- Note:
 - Decrease Dose to 1/10 for patients on MAOIs.
 - Extravasations causes tissue necrosis
 - To calculate IV Infusion use chart in latest ed of Critical Care Pocketbook.

• Epinephrine (Adrenalin)

- Preparation:
- Pregnancy Cat: C
- Indications: Sympathomimetic: Used for Anaphylaxis, allergic rxns, asthma, bradycardia/hypotension.
- Dosing (Adult):
 - **Allergic reaction:** 0.3-0.5 mg (0.3-0.5ml 1:1000) SQ
 - **Anaphylaxis:** 0.3-0.5 mg (3-5 ml 1:10,000) IV
 - **Asthma:** 0.3-0.5 mg (0.3-0.5ml 1:1000) SQ
 - **Bradycardia / hypotension:** 2-10 mcg/min IV (mix 1 mg in 250 ml D5W)
 - **Cardiac arrest:**
 - 1 mg IV every 3-5 min. OR
 - High Dose – 0.2 mg/kg IVP every 3-5 min OR
 - Endotracheal Dose – 2-2.5 mg every 3-5 min
- Dosing (Pediatrics):
 - **Allergic reaction:** 0.01mg/kg (1:1000) SQ (Max 0.5 mg)
 - **Asthma:** 0.01 mg/kg SQ (1:1000) (Max dose 0.4 ml)
 - **Anaphylaxis:** 0.01 mg/kg (1:10,000) IV(Repeat every 15 min X 2 doses)
 - **Bradycardia:**
 - IV Dose: 0.01 mg/kg (1:10,000- 0.01 ml/kg)
 - Endotracheal Dose: 0.1mg/kg (1:1000 – 0.1 ml/kg) Repeat every 3-5 min.
- Onset/Peak/Duration: SQ: 5-15 min, Duration 20 min-4 hrs.
- Side Effects: Tachydysrhythmias, VT, VF, HTN, angina
- Relative Contraindications: Coronary Artery Dz (CAD), Tachydysrhythmias

• Etomidate

- Preparation: n/a
- Pregnancy Cat: C
- Indications: Induction of General Anesthesia
- Dosing (Adult): 0.3 mg/kg IV (given over 30-60 seconds)
- Dosing (Pediatrics): same
- Onset/Peak/Duration: Onset: 45-60 seconds
- Side Effects: transient muscle jerking, averting movements, nausea/vomiting, apnea
- Contraindications: hypersensitivity to drug, caution in elderly, avoid repeat dosing

• Fentanyl (Sublimaze)

- Preparation: 0.05mg/ml (50 ug/ml)
- Pregnancy Cat: B
- Indications: Acute mod-severe pain, mild anxiolytic, sedation, pretreatment RSI
- Dosing (Adult):
 - **Analgesia:** 25mcg-50mcg IV. Give with slow infusion over 1-2 minutes.
 - **RSI Pretreatment:** 3mcg/kg .
 - **Sedation:** 1mcg/kg IV
 - **Rectal:** 1st dose in adults (25mcg). If no response in 3-4 minutes, repeat dose
 - **Severe Head Trauma:** 1mcg /kg/hr IV
- Dosing (Pediatrics): 1-2 ug/kg IV. Same administration techniques as above.
- Onset/Peak/Duration: Onset: 1-2 min, Peak 3-5 min, Duration 0.5-1 hr
- Side Effects: **Respiratory Depression, allergic reaction (skin rash, wheezing),** somnolence, nausea, vomiting, **hypotension**, stomach cramps, decreased urination, increase LOC, apnea.
- Contraindications: Administration of other sedating medications, respiratory depression, hypotension, CNS depression, allergy, asthma, MAOI use, Myasthenia Gravis
- Reversal:
 - **Adult:** Naloxone 0.4mg-2mg IV
 - **Pediatric:** 0.01 mg/kg IV

• Flumazenil (Romazicon)

- Preparation: INJ 0.1 mg/ml
- Pregnancy Cat: C
- Indications: **Antidote/reversal of Benzodiazepine Overdose**
- Dosing (Adult): 0.2-0.5 mg IV (Max dose 3 mg in one hour)
- Dosing (Pediatrics): 0.01 mg/kg IV/IO (Up to 0.2 mg single dose). Max Total Dose 1 mg.
- Onset/Peak/Duration: Onset 1-2 min, Half life 41-79 min
- Side Effects: Seizure, N/V, Agitation, Withdrawal. Watch for re-sedation.
- Contraindications: TCA Overdose, Status Epilepticus, Increased ICP, Allergy to Benzodiazepines.

• Glucagon

- Preparation: INJ 1mg/ml: powder for IM, IV, or SC injection after reconstitution.
- Pregnancy Cat: B
- Indications: **Hypoglycemia or Beta Blocker Overdose**
- Dosing (Adult):
 - **Hypoglycemia:** 0.5-1mg (or unit) IM, SQ, IV.
 - **Beta Blocker Overdose:** 3-10mg IV (50-150mcg/kg), followed by drip: 1-5mg/hour
- Dosing (Pediatrics):
 - > 20 Kg: 1 mg IV/IO, SC, IM up to 1mg.
 - <20 Kg:) 0.5 mg or 20-30mcg/kg
- Onset/Peak/Duration:
- Side Effects: Gastrointestinal upset, hypersensitivity reactions (urticaria, respiratory distress, hypotension).
- Contraindications: Pheochromocytoma
- Note:
 - When the patient responds, give supplemental carbohydrate, e.g. prompt meal, orange juice, D50%, etc., as soon as possible.
 - (If patient doesn't respond in 15 min may give 1-2 more doses)

• Ketamine (Ketalar)

- Preparation: 50mg/ml (10 mg/ml) vial
- Pregnancy Cat: C
- Indications: Dissociative anesthetic, analgesia, sedation, Cases of Head Trauma with Severe Hypotension.
- Dosing (Adult): 1-2 mg/kg IV. Slowly (60 seconds)
- Dosing (Pediatrics):
 - **Dissociative Conscious Sedation:** 1 mg/kg IV (25-50mg/min). Slowly (60 seconds)
 - **RSI:** 2mg/Kg IV Slowly (60 sec).
- Onset/Peak/Duration: Onset: 30-60 seconds. Duration: approx. 10-20 minutes
- Side Effects: Hypertension, Increase Heart Rate, hallucinations, respiratory depression with “rapid IV administration of high doses”, bronchodilation, increase Mean Arterial Pressure, Cerebral blood flow.
- Contraindications: Hypertensive crisis, allergy.
- **Note:**
 - **USE ONLY FOR ICP PATIENTS THAT HAVE SEVERE HYPOTENSION.** Preserves respiratory drive, increases HR, contractility, MAP, cerebral blood flow, and bronchodilation.
 - Use lowest dose and titrate for effect.
 - **CONTRAINDICATED IN PT'S WITH ICP AND HYPERTENSION AND/OR SPONTANEOUS CEREBRAL HEMORRHAGE.**

• Ketorolac (Toradol)

- Preparation: INJ: 15, 30, 60 mg/ml
- Pregnancy Cat: C
- Indications: Analgesia: Mild to moderate pain
- Dosing (Adult): 15-30 mg IV or 30-60 mg IM. IM/IV (multiple dosing): 15mg every 6 hours, max: 60mg/day x 5 days.
- Dosing (Pediatrics):
- Onset/Peak/Duration: IM: Peak 50 minutes.
- Side Effects: Nausea & vomiting, Gastrointestinal bleeding, edema, dizziness, hypertension, nephrotoxicity, dysuria, hematuria, oliguria, azotemia, blood dyscrasias.
- Contraindications: hypertensive crisis, allergy, asthma, severe renal/hepatic disease, peptic ulcer disease.

• Labetalol (Normodyne)

- Preparation: INJ: 5mg/ml in 20-ml amps.
- Pregnancy Cat:
- Indications: Antihypertensive
- Dosing (Adult): **Hypertensive crisis:** 10-20 mg IV over 1-2 minutes. May repeat or double dose every 10 minutes until a total of 150-300 mg OR start infusion of 2-8 mg/min.
- Dosing (Pediatrics):
- Onset/Peak/Duration: Onset: 5 minutes. Peak: 15 minutes. Duration: 2-4 hours
- Side Effects: hypotension, nausea, dizziness, sweating, congestive heart failure, ventricular arrhythmias, agranulocytosis, thrombocytopenia, bronchospasm, headache, mental changes, drowsiness, fatigue, paresthesias.
- Contraindications: asthma, cardiac failure, 2nd or 3rd degree heart block, severe bradycardia, cardiogenic shock, hypotension.
- Notes:
 - Alpha-1 and β -Adrenergic Blocker.
 - Blood pressure reduction should not exceed a 20-25% reduction within the first 30-60 min.

• Lidocaine (Xylocaine)

- Preparation: 10 mg/ml, 20 mg/ml
- Pregnancy Cat: C
- Indications: Rapid control of acute ventricular arrhythmias (V-Tach/VFib)
- Dosing (Adult):
 - **Cardiac Arrest (VT/VF):** 1.0-1.5 mg/kg IVP (May repeat with 0.5-0.75 Mg/kg IVP every 5-10 min)(MAX is 3.0 mg/kg).
 - ETT Dose: 2-4 mg/kg
 - **VT with Pulse:** 1.0-1.5 mg/kg IVP (May repeat with 0.5-0.75 Mg/kg IVP every 5-10 min)(MAX is 3.0 mg/kg).
 - **PVCs:** 0.5-1.5 mg/kg IV. Followed by 0.5-1.5 every 5-10 min (MAX 3.0 mg/kg)
 - **RSI Pretreatment:** 1.0-1.5 mg/kg IV.
- Dosing (Pediatrics):
 - RSI Pretreatment: 1.5-2.0 mg/kg IV (up to 6 yrs old)
- Onset/Peak/Duration: n/a
- Side Effects: Head Ache, Dizziness, Involuntary Movement, Seizures, Hypotension, Bradycardia, heart Block, CV Collapse, Arrest, Methemoglobinemia, Respiratory Depression.
- Contraindications: Hypersensitivity to amides, severe heart block, SVT, WPW, Stokes-Adams Syndrome.
- Notes: **RSI Pretreatment mitigates catecholamine release caused by laryngeoscopy.**

• Lorazepam (Ativan)

- Preparation: 2, 4 mg/ml INJ;
- Pregnancy Cat: D
- Indications: Status Epilepticus, Anxiety, Sedation
- Dosing (Adult):
 - **Status Epilepticus:** 2.0-4.0 mg slowly IV (Must dilute in D5W or 0.9% NS 1:1)
 - **Sedation and Anxiety:** 0.05 to 2mg mg IV or IM every 6-8 hrs or (up to 3-4 mg MAX daily dose)
- Dosing (Pediatrics):
 - **Sedation:** 0.05-0.2 mg/kg IV, IO (Slowly) or IM (Must dilute in D5W or 0.9% NS 1:1).
- Onset/Peak/Duration: **Onset:** 5-15 min (IV); **Duration:** 6-8 hrs
- Side Effects: Apnea, N&V, drowsiness, restlessness, delirium, respirator depression.
- Contraindications: Acute Angle Glaucoma Reversal: **Flumazenil: Adult: IV 0.3 mg over 30 seconds; wait 30 sec, then give 0.3 mg over 30 sec if consciousness does not occur; 0.5mg over 30 sec at intervals of 1 min up to cumulative dose of 3 mg., Pediatric: IV 10mcg (0.1mg/kg), cumulative does of <1 mg.**

• Magnesium Sulfate 10%

- Preparation: 10% INJ
- Pregnancy Cat: B
- Indications: Cardiac Arrest, Torsades with a pulse, Acute MI, Seizures, and Magnesium deficiency.
- Dosing (Adult):
 - **Cardiac Arrest:** 1-2 grams IV (5-10 grams may be required)
 - **Torsades with a pulse:** 1-2 grams IV over 60 min (Mix in 50 ml D5W) Start drip of 0.5-1 gram/hr and titrate to effect.
 - **Acute MI:** 1-2 grams IV over 60 min (Mix in 50 ml D5W) Start drip of 0.5-1 gram/hr: run for up to 24 hrs.
 - **Seizures secondary to eclampsia:** 1-4 gram IV slowly
 - **Mag deficiency:** 0.5-1.0 gram/hr.
- Dosing (Pediatrics): 25-50 mg/kg IV, IO over 10-20 min (MAX 2.0 Grams)
- Onset/Peak/Duration: **Onset:** 30 min (IV); **Duration:** 30 min (IV)
- Side Effects: flushing, flaccid paralysis, circulatory collapse, N/V

- Contraindications: Abd. Pain, obstruction, acute surgical abd., rectal bleeding

• Mannitol 20%

- Preparation:
- Pregnancy Cat: C
- Indications: Osmotic Diuretic used for Cerebral Edema
- Dosing (Adult):
 - **Cerebral Edema with increased ICP**: 1-2 grams/kg IV over 30 min. May repeat if no effect. Consider using 3% NS instead of mannitol.
- Dosing (Pediatrics): 1g/kg IV or IO slowly over 30 minutes.
- Onset/Peak/Duration: Onset: 30-60 min for diuresis. Duration 3-8 generally.
- Side Effects: CHF, Acidosis, Seizures, chest pain, increased heart rate, electrolyte depletion, dehydration, decreased BP, Coma, hyperosmolality, and Headache.
- Contraindications: renal impairment severe dehydration, severe heart dz, pulmonary edema.

• Metoprolol (Lopressor)

- Preparation: 1.0 mg/ml INJ
- Pregnancy Cat: C
- Indications: Cardio-selective β -2 Blocker. For **VT; Vfib; Afib; Aflutter; PSVT; HTN; and myocardial salvage for acute MI, with HTN, Tachycardia, and refractory CP from excess sympathetic tone.**
- Dosing (Adult): 5 mg IV slowly over 2-5 min, repeated every 5 min to a total of 15 mg.
- Dosing (Pediatrics): N/A
- Onset/Peak/Duration: Onset: Immediate; Peak: 20 min; Duration 6-8 hrs.
- Side Effects: Decrease BP, CHF, Bronchospasm (not as likely with this drug as non-selective β blockers), Decreased HR, Chest pain, Headache, N&V
- Contraindications: Decreased BP, CHF, Acute pulmonary edema, bronchospasm, bradycardia, hypotension, cardiomegaly, thyrotoxicosis, Hx of asthma.
- Note: Calcium Channel Blockers may potentiate side effects

• Midazolam (Versed)

- Preparation: N/A
- Pregnancy Cat: D
- Indications: Sedation, General Anesthesia, Seizures
- Dosing (Adult):
 - Sedation: 1 mg IV q 2-3 min, Anesthesia Induction: 0.3 mg/kg IV, Anesthesia maintenance: 0.02-0.1 mg/kg/hr IV
- Dosing (Pediatrics): Sedation: 0.05 mg/kg IV, Anesthesia maintenance: 0.05-0.15 mg/kg IV q1-2 hours
- Onset/Peak/Duration: Onset: 2-3 minutes
- Side Effects: hypotension, asystole, cardiac arrest, respiratory & CNS depression, flushing, sweating.
- Contraindications: renal dz, heart block, hypermagnesemia.

• Morphine Sulfate

- Preparation: 0.5 mg/ml, 1 mg/ml
- Pregnancy Cat: B
- Indications: Acute mod-severe pain, mild anxiolytic
- Dosing (Adult): 2.5mg-10mg IV (in 4-5ml of sterile water). Slow administration over 4-5 min. Rec 1st dose: 5mg IV, if not response in 15-20 minutes, repeat dose.
- Dosing (Pediatrics): 0.1- 0.2mg/kg IV (in 4-5 ml sterile water). Slow admin over 4-5 min
- Onset/Peak/Duration: Rapid 4-5 minutes / Peak in 20 minutes / Duration 4-5 hours
- Side Effects: **Respiratory Depression, allergic reaction (skin rash, wheezing),** decrease LOC, decrease Heart Rate, somnolence, nausea, vomiting, **hypotension,** stomach cramps, decreased urination
- Contraindications: Administration of other sedating medications, respiratory depression, hypotension, CNS depression, allergy, asthma, head injury, acute abdomen
- Reversal: **Naloxone 0.4mg-2mg IV , Pediatric: 0.01 mg/kg IV**

• Naloxone (Narcan)

- Preparation: 0.02, 0.4 mg/ml INJ
- Pregnancy Cat: C
- Indications: Narcotic Antagonist- For reversal of Opiate overdose.
- Dosing (Adult):
 - **Opioid Overdose:** 0.4-2mg IV, IM, SQ, ETT every 2-3 min as needed up to a MAX of 10mg total
- Dosing (Pediatrics):
 - **Opioid Overdose:** 10 Mcg (0.01 mg/kg) every 2-3 min.
- Onset/Peak/Duration: Onset: 1 min (IV); Duration: 45 min
- Side Effects: Withdrawal sx in addicted patients.
- Contraindications: Do not use on a newborn if mother is addicted to opiates- may cause withdrawal.

• Nitrates (Nitroglycerin)

- Preparation: SL tab, Paste, Transdermal patch, buccal, topical spray, IV and topical ointment
- Pregnancy Cat: C
- Indications: Acute coronary syndrome, acute MI, Angina, CHF with acute pulmonary edema
- Dosing (Adult):
 - **SL Tabs:** 0.3-0.4 mg SL (May repeat in 3-5 min)(MAX is 3 doses).
 - **Nitro Paste or Patch:** 1-2 cm of paste (6-12 mg) topically
 - **Nitro Spray:** 1-2 sprays (0.4-0.8 mg) under tongue.
 - IV: 10-200 mcg/min (Have bag premixed 25mg in 250 ml of D5W = 100mcg/ml)(See Critical Care Pocketbook Drip guidelines)
- Dosing (Pediatrics):
 - 0.25-0.5mcg/kg/min IV. Titrate to Pt response.
 - 1-3 mcg/kg/min transmucosal
- Onset/Peak/Duration: Varied
- Side Effects: Headache, flushing and dizziness, hypotension, tachycardia, syncope, vomiting
- Contraindications: decreased BP, hypovolemia, intracranial bleeding, aortic stenosis, right ventricular infarction (Nitro decreases preload and after-load, and might decrease R. Ventricular filling), severe brady/tachycardia, **recent use of Viagra, Cialis or Levitra.**

• Norepinephrine (Levophed)

- Preparation:
- Pregnancy Cat: C
- Indications: Vasopressor, used for **Cardiogenic, septic and/or neurogenic shock**. Acts on Alpha and Beta receptors of heart and vasculature.
- Dosing (Adult): 0.5-30 mcg/min. Mix 4 mg in 250 ml of D5W = 16 mcg/ml. See Critical Care Pocketbook for drip-rate chart.
- Dosing (Pediatrics): 0.1-2mcg/kg/min and titrate to effect (Blood pressure). (MAX = 2.0 mcg/kg/min). See Critical Care Pocketbook for drip-rate chart
- Onset/Peak/Duration: Onset: 1-2 min IV
- Side Effects: Tachydysrhythmias, VT, VF, HTN, N&V, Acute Myocardial Infarction, ischemia, decreased renal perfusion, decreased urine output.
- Contraindications: Hypovolemia (unless as a temporary measure until volume can be replaced). Mesenteric or peripheral vascular thrombosis, ischemic heart Dz.
- Note: Extravasation causes tissue necrosis.

• Normal Saline Hypertonic 3%

- Preparation: 250, 500 ml Bags
- Pregnancy Cat: N/A
- Indications: Can be used in lieu of Mannitol for Cerebral Edema (Increased ICP)
- Dosing (Adult):
 - **Bolus:** 250-500 cc IV Bolus over 15 min
 - **Infusion:** 40 cc/hr
- Dosing (Pediatrics):
 - **Bolus:** 5 cc/kg IV Bolus over 15 min.
 - **Infusion:** 0.5 cc/kg/hr
- Onset/Peak/Duration: N/A
- Side Effects:
- Contraindications: Do not use in same line as Blood Products – cause crenation and lysis of RBC.
- Notes: Potential benefits in head trauma by limiting cerebral edema, lowering ICP and improving Cerebral Perfusion Pressure (CPP).

• Ondansetron (Zofran)

- Preparation:
- Pregnancy Cat: B
- Indications: Antinausea
- Dosing (Adult): 4 mg IV slowly or IM.
- Dosing (Pediatrics): 0.1 mg/kg IV slowly, IM (Max 4 mg)
- Onset/Peak/Duration: Half-life 3.5-4.7 hours
- Side Effects: Head Ache, Diarrhea, fatigue, Sz, dizziness, Fever, Extrapyrimal symptoms.

Contraindications: Hypersensitivity to agent, may ppt with bicarbonate.

• Phenylephrine (NeoSynephrine)

- Preparation: INJ 1% (10mg/ml) “Pressor”
- Pregnancy Cat: C
- Indications: Hypotension, PSVT, Shock, Maintain BP for spinal anesthesia
- Dosing (Adult): **Hypotension:** IV: 0.1-0.5mg slowly every 10-15 mins, as necessary to obtain BP
PSVT: IV: 0.5mg over 20-30 seconds.
Shock: IV INF: 10mg/500ml D₅W given 100-180 mcg/min, then maintenance of 40-60 mcg/min; use infusion device
- Dosing (Pediatrics): **Hypotension:** IM/SC: 0.1 mg/kg/dose every 1-2 hours prn.
Shock: IV BOLUS: 5-20 mcg/kg/dose q 10-15 mins.
IV Infusion: 0.1-0.5mcg/kg/min
- Onset/Peak/Duration: IV: Onset: Immediate, Duration 20-30 mins.
IM/SQ: Onset 10-15 mins, Duration: 45-60 mins.
- Side Effects: headache, seizure, weakness, CVA, chest pain, bradycardia, HTN, dysrhythmias, restlessness, resp. Distress, anaphylaxis, gangrene
- Contraindications: Hypersensitivity, severe HTN, VT, mesenteric or peripheral ischemia. Use caution in patients with heart block, hyperthyroidism, bradycardia, severe arterosclerosis.
- **NOTE:** If extravastion occurs; stop infusion: inject 5-10 mg phentolamine SQ mixed in 10-15 ml NS. Potentiated by TCA's, atropine, oxytocics, and MAOI.
- Antagonized by diurectics, Alpha and Beta blockers, phenothiazines

• Promethazine (Phenergan)

- Preparation: Many Forms, Tabs, INJ, Rectal Supp.
- Pregnancy Cat: C
- Indications: Antinausea
- Dosing (Adult):
 - **Nausea / Vomiting:** 12.5-25 mg IV/IM/Rectal (or 25mg PO) (Can repeat every 4-6 hrs as needed)
 - **Sedation:** 25-50 mg IV/IM/PO
- Dosing (Pediatrics)(Do not use in < 2 years of Age):
 - **Nausea / Vomiting:** 0.25-0.5 mg/kg IV, PO, IM and Rectal every 4-6 hrs prn.
 - **Sedation:** 0.5-1.1 mg/kg IV. (12.5-25 mg PO/IM/Rectal)
- Onset/Peak/Duration:
 - PO: Onset: 20 min; Duration: 4-12 hrs
 - IV: Onset 3-5 min
- Side Effects: Drowsiness, viscous bronchial secretions, urinary urgency, Extrapyramidal symptoms.
- Contraindications: Allergy to antihistamines and phenathiazines, lactating females, MAOI use, COPD and Hypertension, Pregnancy (Use Zofran instead).
- Note:
 - **Can cause thrombophlebitis- requires a slow IV Push with a Saline flush.**
 - **For EPS Side Effects use Benadryl 25-50 mg IV.**

• Propofol

- Preparation: Varies (typical given in 10mg/ml)
- Pregnancy Cat: B
- Indications: Sedation and maintenance of General Anesthesia
- Dosing (Adult):
 - **RSI Anesthesia**: 1.0-2.5 mg/kg IVP. **Maintenance** is 100-200 mcg/kg/min (0.1-0.2 mg/kg/min).
 - **For Drip Infusion see Critical Care Pocketbook**
- Dosing (Pediatrics): same
- Onset/Peak/Duration: Onset: 40 sec
- Side Effects: hypotension, involuntary muscle movements, rash, pruritis, pain at injection site
- Contraindications: Hypotension (hemodynamically unstable), hypersensitivity to drug (or egg, soy)

• Rocuronium (Zemuron)

- Preparation: 10 mg/ml INJ
- Pregnancy Cat: C
- Indications: Induction of paralysis. May use with ICP: Intracranial Hypertension
- Dosing (Adult): 1.0 mg/kg IVP (for maintenance repeat dose approximately every 15-20 min)
- Dosing (Pediatrics): 0.6 mg/kg IVP
- Onset/Peak/Duration: Onset: 1-3 minutes. Recovery: 30 mins.
- Side Effects: brady/tachycardia, bronchospasm, arrhythmias, BP changes
- Contraindications: Caution if impaired hepatic or respiratory function. Severe obesity
- Note: Treatment of overdose: Endrophonium, or neostigmine, atropine.

• Sodium Bicarbonate 8.4%

- Preparation: 8.4% INJ
- Pregnancy Cat: C
- Indications: **Cardiac Arrest** with good ventilation; **hyperkalemia**; **overdose** of TCA, phenobarbital, diphenhydramine, ASA, and cocaine.
- Dosing (Adult): 1 mEq/kg IV (Cardiac Arrest is 1 ml/kg)
- Dosing (Pediatrics): Same
- Onset/Peak/Duration: Onset: 15 min (IV); Duration 1-2 hrs.
- Side Effects: Metabolic Alkalosis, Decreased Potassium, Fluid Overload, Twitching, Hyperreflexia, Sz, Cardiac Arrest, Apnea
- Contraindications: Metabolic Alkalosis, Hypochloremia & Hypocalcemia
- Notes: Must ventilate patient after administration.

• Succinylcholine

- Preparation: 20, 50 100 mg/ml INJ (Injection powder 100, 500 mg vial, 1 gram vial)
- Pregnancy Cat: C
- Indications: Induction of paralysis for ET tube.
- Dosing (Adult): 1-1.5 mg/kg IV (Max 150 mg)
- Dosing (Pediatrics): 1-2 mg/kg IV
- Onset/Peak/Duration: Onset: 1 minute, Peak 2-3 min; duration 6-10 minutes
- Side Effects: apnea, malignant hyperthermia, decreased HR, HTN, Decreased BP, Increased IOP. Rare: hyperkalemia, arrhythmias, cardiac arrest
- Contraindications: Major trauma and/or burn pts, elevated potassium levels, myopathies, caution with children. Penetrating eye injuries, history of malignant hyperthermia, acute angle closure glaucoma.

• Vasopressin (Pitressin)

- Preparation: 5, 20 units/ml INJ
- Pregnancy Cat: C
- Indications: **Vasopressor for Cardiac arrest, VFib, VTach.**
- Dosing (Adult): 40 units IVP/IO
- Dosing (Pediatrics): 2.5-10 units IM/SQ BID-QID as needed.
- Onset/Peak/Duration:
- Side Effects: IV site pain (must flush), N/V/D, Angina, trembling, eructation, pallor, confusion, hives, wheezing
- Contraindications: Chronic nephritis, migraine, epilepsy, CHF, Asthma, CAD, Pregnancy/Lactation

• Vecuronium (Norcuron)

- Preparation: 10 mg/5ml vial (2 mg/ml) INJ
- Pregnancy Cat: C
- Indications: Induction of paralysis for ETT
- Dosing (Adult): 0.1 mg/kg IVP
- Dosing (Pediatrics): same
- Onset/Peak/Duration: Onset: 2-3 min; Duration 15-25 min; Recovery 45-75 min.
- Side Effects: skeletal muscle weakness, prolonged paralysis, apnea, bronchospasm, tachycardia, dyspnea, hypotension, anaphylaxis
- Contraindications: Caution with major trauma and/or burn pts, elevated potassium levels, myopathies, caution with children, Myasthenia gravis.
- Note: Tx. For overdose: Edrophonium or neostigmine, atropine.

USEFUL CALCULATIONS

PEDIATRIC FORMULAS:

- **ETT Size** = Age/4+4 (Age divided by 4 plus 4)
- **ETT Depth** = 3 x ETT Size (Endotracheal)
- **Weight in kg** (>1 year) = (Age (years) x 2) + 10
- **Systolic Blood Pressure minimum** = 70 + [2 x Age (years)]

MEDICATION FORMULAS:

- **Mcg/kg/min (micrograms/kilogram/minute)** = [16.7 X Drug Concentration (mg/ml) x infusion rate (ml/h)] Weight (kg).
- **INFUSION RATE (ml/h)** = [Desired mcg/kg/min x Weight (kg) x 60]/Drug concentration (mcg/mL)

HEMODYNAMIC FORMULAS:

- **MAP:** Mean Arterial Pressure = [(2 x SBP) + DBP]/3.
- SBP = (Systolic Blood Pressure)
- DBP = (Diastolic Blood pressure)
- / = (divided by)
- **PULSE PRESSURE:** SBP – DBP or (Sytolic Blood Pressure minus Diastolic Blood pressure).

Common Conversions:

- Lb = kg x 2.2 or kg = lb x 0.45
- Fahrenheit = (Celsius x 1.8) + 32 or Celsius = (Fahrenheit -32) x 5/9
- 1 tsp = 5 ml
- 1 tbsp = 15 ml
- 1 oz = 30 ml
- 1g = 1,000 mg
- 1mg = 1,000 mcg
- 1 g = 10,000 mcg

USEFUL CALCULATIONS (CONT)

Length of Use for Compressed O2 Cylinders: Approx. Guide

Cylinder	D	E	G	H
Liters	356	622	5260	6900
Flow (LPM)	Length of use (mins)	Length of use (mins)	Length of use (mins)	Length of use (mins)
2	178	311	2630	3450
4	89	155	1315	1725
6	59	104	876	1150
8	44	78	658	862
10	35	62	526	690
12	30	52	438	575
15	23	41	350	460

NOTE: Current MEDEVAC Oxygen Cylinder is "D" type.

To estimate duration of use for Oxygen Cylinders:

- Duration of Flow = Contents of cylinder / Flow rate.

Cylinder Factors for Calculation of Duration of Oxygen Flow:

- **Cylinder Size** D E G H and K
Factor 0.16 0.28 2.41 3.14

Once you have the cylinder factor and the amount of pressure remaining in the cylinder, the duration of flow can be calculated with the following equation.

Duration of flow (mins) = Pressure (psig) x Cylinder Factor/Flow (L/min)

COMMON LABORATORY VALUES

Laboratory	Conventional	SI Units
General Chemistry		
Anion Gap	8-16 mEq/L	8-16 mmol/L
BUN	8-25 mg/100mL	2.9-8/9 mmol/L
Calcium	8.5-10.5 mg/100mL	2.1-2.6 mmol/L
Carbon Dioxide	24-30 mEq/L	24-30 mmol/L
Creatine	Male: 0.2-0.5 mg/dL Female: 0.3-0.9 mg/dL	
Creatine Kinase	Male: 17-40 U/L Female: 10-79 U/L	
Creatinine	0.6-1.5 mg/100L	53-133
Glucose	70-110 mg/100mL	3.9-5.6 mmol/L
Potassium	3.5-5.0 mEq/L	3.5-5.0 mmol/L
INR	0.8-1.2 2.0-3.0	Tx/prophylaxis DVT
Platelets	140,000-450,000/ml	
Hematology		
Hemoglobin	Male: 13-18 g/100 mL Female: 12-16 g/ 100mL	
Hematocrit	M: 45-52% F: 37-48%	
Cardiac Markers		
Tropin I	0-0.1 ng /ml	Onset: 4-6 hrs, Peak: 12-24 hrs
Tropin T	0-0.2 ng/ml	Onset: 3-4 hrs Peak: 10-24 hrs
Myoglobin	M: 10-95 ng/ml F: 10-65 ng/ml	Onset: 1-3 hrs Peak: 6-10 hrs
NORMAL BLOOD GASES		
pH	7.35-7.45	
Po2	75-100 mm Hg	
Pco2	35-45 mm Hg	
HCO3	22-26 mmol/L	
Base excess	(-2)-(+2) mEq/L	
CO2	19-24 mEq/L	
SaO2	96-100%	

An Informal Study of the
Alaris 2865B Multichannel IV Pump
in Afghanistan's Rotor Wing
MEDEVAC Mission

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10 October, 2010

The Alaris 2865B is a multichannel IV pump featuring three independent fluid delivery systems in the space of one compact size. This reduces bedside clutter, and simplifies patient transport within the facility. The authors have used the Alaris 2865B on thousands of patients in the inpatient setting. As such, they are considered experts in its operation and intricacies.

Overall, the Alaris 2865B is a dependable pump with a long history of use in the inpatient setting. It is ideally suited for the ICU and OR, as it is small and easy to transport. It has also been used by CCATT on fixed wing transport for several years with good results. However, during transport on non-pressurized rotor wing aircraft in Afghanistan, this pump has been known to have a propensity for failure.

The most common issue with the pump in Afghanistan is the “Air In Line” (AIL) alarm. If not caught, this alarm will stop the pump until corrected. If the pump is delivering vasoactive drugs, the delivery of these drugs is halted until the alarm is cleared. This can result in sporadic delivery, fluctuating vital signs, and could possibly place the patient at risk.

In an effort to quantify the actual occurrences of pump failures due to the AIL alarm, an informal preliminary study was developed. In this study, an Alaris 2865B pump was set up in an aircraft, and the infusion set primed with a 1000 ml bag of normal saline. All air was removed from the normal saline bag and IV infusion set during priming. The delivery set was attached to a pediatric IO catheter placed through the cap of a plastic bottle. The rate of infusion was set at 75ml/hr, and the quantity delivered was collected in the plastic bottle. The pump was activated as the aircraft began a mission, and was deactivated upon mission completion to simulate the conditions encountered during a typical mission day. Temperatures during the testing period ranged from 55 degrees to 85 degrees Fahrenheit. At the end of two days, the fluid in the collection bottle was measured and compared to the delivery amount indicated on the pump. The results are as follows;

Mission Number	Start	End	Comment
MM(E)10-06A/B	0436	0602	AIL alarm upon start. Required several depressions of the “Clear Air” button, resulting in additional 4ml delivered as bolus. AIL alarm in flight, went unnoticed by medic due to aircraft noise.
MM(E)10-06H	1605	1747	No issue.
MM(E)10-06G/07A	0911	1120	No issue.

MM(E)10-07H	1816	1913	AIL alarm upon start. Required two depressions of the "Clear Air" button, resulting in additional 2ml delivered as bolus.
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The "Air In Line" (AIL) alarm is caused by small bubbles passing by the air sensor in the mechanical pump chamber of the pump set. These bubbles form as a result of changes in barometric pressure. In Jalalabad, the elevation is just over 1800 feet above sea level, Bagram is at approximately 5000 feet, and the mountain between the two requires a brief period of flight at approximately 10,000 feet above sea level. If during this flight the barometric pressure at Jalalabad is 28 in Hg, the pump and IV fluid will be exposed to decreasing pressure to approximately 20 in Hg as the aircraft climbs to cross the pass between the two cities. When the aircraft finally lands at Bagram, the barometric pressure will be approximately 25 in Hg. Over the course of the trip, the atmospheric pressure on the fluid in the bag will have decreased by as much as 30% for several minutes, causing microbubbles to form in the tubing. The vibration of the aircraft further complicates the issue by mobilizing the bubbles, allowing them to aggregate and flow down the tubing to the air sensor. It is this aggregation of microbubbles that causes the AIL alarm to occur.

During this test, the pump ran approximately 6.25 hours. The total amount indicated as delivered during the test was 469ml. The actual amount delivered as measured in the container was 487ml. This represents an error of approximately +4% in the delivery rate of the pump. This may or may not be an important issue, depending on the substance being infused.

In addition to its sensitivity to air bubbles, this IV pump has a limited acceptable temperature operating range. The acceptable range for this pump, according to the manufacturer, is 50-104 degrees Fahrenheit. Evidence suggests this range is often exceeded in the rotor wing environment during the winter and summer extremes Afghanistan typically experiences. Some users have reported sudden pump failure during winter months when the pump is exposed to rotor wash after being inside the cabin of the aircraft, resulting in non-delivery of medication to the patient.

Due to the combination of anecdotal information, as well as the information gathered in this limited study, we believe the Alaris 2865B is a very good pump for use at the bedside, as well as in the fixed wing environment. However, it's propensity for AIL alarms combined with the barometric pressure extremes encountered in rotor wing aircraft in Afghanistan, as well as and its limited operating temperature range, make this pump a poor choice for the rotor wing MEDEVAC mission in Afghanistan.

This is a very simple informal study designed to show whether additional studies are necessary regarding this pump. The study was completed over a very short period of time (two days), and cannot begin to replicate all possible weather conditions, temperature extremes, or altitude variations one could expect in Afghanistan. However, the results did show that this pump has a very high sensitivity to air bubbles in the line. As a result, it is the authors' opinion that further studies of alternatives should be undertaken. In the interim, the use of this pump should be carefully considered when delivering critical medications to patients. In some cases, it may be more beneficial to the patient if certain medications were delivered in controlled boluses to ensure proper delivery.

BLOOD PRODUCTS

1. PRBC'S: Packed Red Blood Cells: 250-350 ml. Approx. 350ml = 1 unit

- RBC's and Plasma
- Must be ABO, RH compatible
- O negative if unknown. ***Female: O Negative***
- Increase O₂ carrying capacity * Primary reason!
- Maintain volume and oxygen capacity: Minimal Volume Expansion
- Administer over 90 mins - 4 hours. Usually 18-20ga IV with Y-type IV transfusion set. IV "Bolus" Can be done in emergent conditions.
- Expires after 4 hours
- *Increases Hgb 1 g/dl and Hct 2-3% per unit transfused*
- PRBC's contain zero clotting factors
- **Standard of Practice:** Minimum of 2 units to raise Hct 6% and Hgb 2g/dl. Children: 15ml/kg of PRBC's will increase Hct 6% and Hgb 2 g/dl.

Comments:

1. Massive transfusion may cause hypothermia, low Calcium, high Potassium - dilutional effect
2. Low Calcium due to citrate preservative in PRBC's. Calcium important in the clotting cascade.
3. One unit of FFP (Fresh Frozen Plasma) typically given for every 4 units of PRBC's
4. High volume PRBC transfusion result in decrease in body's clotting factors.

2. WHOLE BLOOD 400-500 ml. Approx. 500 ml = 1 unit

- Contains:
 - a. RBC's,
 - b. WBC's,
 - c. Platelets,
 - d. Plasma
 - e. Clotting factors
- Restores blood volume and O₂ capacity.

BLOOD PRODUCTS (Cont)

3. FFP: FRESH FROZEN PLASMA: 1 FFP unit per 4 units of PRBC's

USE: Liver disease, DIC, TTP, Reversal of Warfarin, Factor XI deficiency.

- Expands blood vol. Restores clotting factors II, VII, IX, X, XI, XII, XIII
- No Platelets
- Use Y-type transfusion set. ABO/RH compatibility
- DOSE: 15ml/kg for massive transfusion. 3-5 ml/kg for warfarin reversal.

4. PLATELETS: 50ml = 1 pack.

Use: Correct low platelet count. Aid clotting factors.

- Platelets, WBC's, Plasma
- ABO/RH compatibility
- Usually ordered as a "6 pack".
- 6 pack over 20-60 mins. Use within 6 hours
- Y-type transfusion set
- Must agitate bag often
- 6 Unit

5. ALBUMIN: 5% and 25% concentrations

- Albumin from plasma.
- No ABO/RH compatibility required
- Vol. Expansion: Burns, Nephrotic Syndrome, Liver Failure
- No clotting factors
- Administer as quickly as tolerated. Use set provided with albumin

BLOOD PRODUCTS (Cont)

6. CRYOPRECIPATE: 20-50 ml.

- It is the cold insoluble protein fraction of FFP
- Each unit of cryoprecipitate approx 20-50ml. Contains about 225 mg of fibrinogen and 80 units of factor VIII and von Willebrand factor (vWF). Some fact XIII and fibronectin
- Mainly used for bleeding patients with fibrinogen levels <100mg/dl due to severe liver dz., DIC, and dilutional coagulopathy
- **Dose: 1 unit of cryoprecipitate per 5kg. Will raise fibrinogen level approx. 75mg/dl. 10 units are given at one time.**

BLOOD TRANSFUSION PROCESS

1. Initiated at the FST, Role III, etc.
2. Verify pt. Info, blood type, blood product component type, expiration date etc.
3. Indicate date and time transfusion was initiated
 - A. Prime Y-type tubing with Normal Saline
 - B. Blood product primed **ABOVE** filter
 - C. Infuse product at desired rate appropriate for product. NS KVO. **Pressure Bag for rapid delivery of the blood product.**
 - D. Maintain vital signs check at initiation, 10-15 mins after transfusion and at end of transfusion
 - E. Monitor for transfusion reactions: allergic, fever, sepsis, hemolytic reaction (chills, fever, back pain, tachycardia, hypotension, renal failure, bleeding).